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Draft Environmental Impact Statement for Metropolitan Seattle. Volume 2 Alki, King County, Washington

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Seattle, WA

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DRAFT
ENVIRONMENTAL IMPACT STATEMENT
SEPTEMBER 1977

METROPOLITAN SEATTLE

ALKI
VOLUME II
KING COUNTY, WASHINGTON

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REGION X, SEATTLE, WASHINGTON

DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR
METROPOLITAN SEATTLE

Volume II

Alki

Number: EPA 910/9-77-043C
King County, Washington

Prepared jointly by:
Environmental Protection Agency,
Region X
Seattle, Washington 98101

Municipality of Metropolitan Seattle
Seattle, Washington

Washington State Department of Ecology
Olympia, Washington

With the Assistance of

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Approved by:

Donald P. Dubois
Regional Administrator

August 25, 1977
Date

INTRODUCTION

A. Action Sponsor

The action sponsor is the Municipality of Metropolitan Seattle (METRO) for purposes of compliance with the State Environmental Policy Act (SEPA Chapter 43.21C RCW) and the Federal Environmental Protection Agency for the purposes of compliance with the National Environmental Policy Act (NEPA).

B. Lead Agency, Responsible Official and Contact Person

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Advisory Agencies:	City of Seattle King County Puget Sound Council of Governments
Consultants:	James M. Montgomery, Consulting Engineers, Inc. (Environmental Impact Statement) Metropolitan Engineers (Facility Plan) Human Resources Planning Institute (Socio-economic studies)

D. Licenses and Permits Required to Implement Wastewater Facilities Plan

Building, grading, complex source permit, shoreline permit and other local governmental permits would be required before implementing most of the alternatives described herein. Eligibility for grant funding by EPA and DOE would be determined after completion of the Final Facility Plan and EIS.

E. Location of EIS Background Data

Municipality of Metropolitan Seattle
Environmental Planning Division
SEPA Information Center
Room 404
600 First Avenue
Seattle, Washington 98104

F. Cost to Public for a Copy of the EIS

No charge while supply lasts.

G. Date of Issue of Draft EIS

This Draft Environmental Impact Statement was made available to the Council on Environmental Quality (CEQ) and the Public on September 23, 1977.

H. Final Due Date for Public and Agency Comments

The final date for submittal of public and agency comments is November 11, 1977. All comments should be sent to Mr. Roger K. Mochnick, Environmental Evaluation Branch, Environmental Protection Agency, 1200 Sixth Avenue, Seattle, WA 98101.

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This Draft Environmental Impact Statement was made available to the Council on Environmental Quality (CEQ) and the public on September 23, 1977.

SUMMARY OF DRAFT EIS CONTENTS

The Draft EIS is summarized in terms of the proposal, the alternatives considered, the direct and indirect impacts on the environment, mitigation measures and mitigating measures to eliminate adverse impacts.

The Proposal

The Municipality of Metropolitan Seattle has prepared a Draft Facility Plan for Puget Sound Plants to the year 2005. Alternatives in the Draft Facility Plan are focused on facilities at West Point, Alki, Carkeek Park, and Richmond Beach, but other sites within these designated service areas have been considered as options. The Metro plant at Renton is not included in the proposed facilities, but effects of alternatives on Renton are described since Renton is an integral part of the Metro system.

This Draft EIS summarizes the impacts of the alternatives for the Alki plant and service area as well as alternative sites in the Duwamish industrial area.

Regional Alternatives

The eight regional alternatives are summarized below, particularly as they affect Alki or the Duwamish area. The Draft EIS analyzes the impacts of the eight regional alternatives proposed in the Draft Facilities Plan, as they would be applied to Alki. Each alternative is evaluated on a co-equal basis in the Draft; no recommended alternative has been selected.

Regional alternatives were developed to address, in various combinations, four polar issues: water quality, site impacts, the law (PL 92-500) and costs. Components considered in developing alternatives included service area, collection system and transfer interceptors, treatment process, plant site, treated wastewater discharge location, combined sewer overflow control and sludge management. Interceptors to serve new growth areas were not included.

Two of the alternatives (A and B) are "no action" alternatives required by SEPA and NEPA. Two of the alternatives (C and D) address combined sewer overflows, a local water quality problem. Four alternatives (E,F, G and H) provide secondary treatment and other variable features. From the eight regional alternatives, it is possible to derive hybrid alternatives that select components from more than one alternative and blend them into a new alternative, such as secondary treatment plus combined sewer overflow controls.

Alternative A - No Action

No capital expenditure would be made for expansion, modification or upgrading of treatment plants and no construction of new interceptors during the planning period (until 2005). Alternative A is evaluated to meet SEPA "no action" requirements.

Under Alternative A, Alki would continue to provide primary treatment, with a capacity in 2005 of 10 mgd average, 30 mgd peak. No capital improvements would be made at the plant, and CSO's would continue in their present pattern.

Alternative B - Metro Comprehensive Plan (No Action Pursuant to PL 92-500)

Plant upgrading and transfer interceptor construction would be done according to the Metro Comprehensive Plan. Alternative B is evaluated as the "no action" alternative pursuant to PL 92-500 and NEPA requirements and serves as the baseline for other alternatives. Puget Sound plants (West Point, Alki, Carkeek Park and Richmond Beach) would be retained with primary treatment. Improved sludge management and disinfection practices would be provided in Alternative B and all following alternatives. Four new transfer interceptors and improvements to the Alki outfall would be included.

At Alki, the outfall would be improved by 1986 for better dilution of wastewater. Primary treatment for 10 mgd average, 30 mgd peak flow would be provided.

Alternative C - Major Combined Sewer Overflow Control

Major portions of combined sewer overflows would be controlled by transfer from fresh to salt water and/or treatment. The existing Puget Sound plants would be upgraded to provide enhanced primary treatment by physical/chemical treatment of solids during the summer. A new wet weather enhanced primary treatment plant would be constructed in the lower Duwamish industrial area and the Alki plant would be abandoned, both in 1995.

Alki would be upgraded to enhanced primary treatment by addition of chemicals in 1983, which would require construction of chemical storage and feeding equipment. A new digester and dewatering facilities would be built for sludge handling. All new equipment would fit on the existing plant property. The outfall to Puget Sound would be extended.

In 1995, flows from Alki would be transferred to other plants, so that the Alki facilities could be demolished and the site abandoned. Through a new connection to the Duwamish, wet weather flows of 30 mgd peak from Alki would be transferred to a new 250 mgd peak wet weather plant in the Duwamish. The Duwamish plant, planned for a Diagonal Way site, would provide enhanced primary treatment for discharge to the Duwamish estuary. In dry weather, Alki flows would be routed to West Point.

Alternative D - Partial Combined Sewer Overflow Control

Wet weather combined sewer overflows would be reduced to Lake Washington, Lake Union, and the West Seattle shoreline. The four Puget Sound plants would be upgraded to enhanced primary treatment with chemical addition during the summer for improved solids removal.

Alki would be upgraded to an enhanced primary plant by 1985 and would operate as such during the planning period to 2005. Chemical storage and feeding equipment plus a sludge digester and dewatering facilities would be constructed at the existing site. The outfall to Puget Sound would be extended.

Alternative E - Secondary

Secondary treatment would be added to the West Point, Alki, and Richmond Beach wastewater treatment plants. The Carkeek Park plant would provide primary treatment for wet weather flows only beginning in 1985; dry weather flows would be pumped to West Point. Carkeek Park would probably be abandoned by 1995, depending on City of Seattle Sewer separation programs.

Secondary treatment would be provided for 10 mgd average, 30 mgd peak capacity at Alki by 1983. The secondary aeration basins and clarifiers would require the use of land which presently contains one ballfield adjacent to the plant. New sludge digestion and dewatering facilities would be built to handle the additional solids load.

Alternative F - Secondary/Southern Strategy

Secondary treatment would be provided at Richmond Beach and West Point (with a reduced service area). A major new secondary treatment facility would be constructed in the Duwamish industrial area in 1985; the Alki plant would be abandoned at that time. A new outfall off Alki Point would be built for discharging effluent from the Duwamish (and Renton) plants. The Carkeek Park plant would provide primary treatment for wet weather flow only beginning in 1985; dry weather flows would be pumped to West Point.

At Alki, interim improvements would be made by 1978, and the plant would provide primary treatment until being demolished and abandoned in 1985. With completion of the Alki to Duwamish transfer interceptor and the new Duwamish plant in 1985, all Alki flows would be transferred there. The Duwamish plant, planned for a site on Harbor Avenue S.W. would provide secondary treatment for 45 mgd average, 145 mgd peak flows. Treated wastewater from the Duwamish and the Renton (99 mgd average, 259 mgd peak capacity) plant would be discharged to Puget Sound through a new outfall, to be constructed off Alki Point.

Alternative G - Secondary/West Point Phaseout Option

Secondary treatment would be provided at the Alki and Richmond Beach plants. West Point would continue as a primary treatment plant for wet weather flows only, beginning in 1985. A new secondary treatment plant in the Interbay area (Commodore Way or Golf Park sites) would be constructed. The Carkeek Park plant would provide primary treatment for wet weather flows only beginning in 1985; dry weather flow would be pumped to West Point.

At Alki, regional Alternative G would be the same as Alternative E: secondary treatment, expanded sludge handling facilities and an extended outfall.

Alternative H - Deconsolidation/Reclamation

Secondary treatment would be provided at West Point, Alki, Carkeek Park and Richmond Beach. Areas of growth would be served by new inland plants with local effluent and sludge re-use possible. Advanced waste treatment would be provided at new North and South Lake Sammamish plants. A new secondary plant at Kenmore would discharge treated effluent to Puget Sound.

At Alki, regional Alternative H would be the same as Alternative E: secondary treatment, expanded sludge handling facilities and an extended outfall.

Environmental Impacts

The primary (direct) and secondary (indirect) impacts of each alternative are described by categories in the physical, biological and human environments plus natural resources and energy. A summary of the major effects of each alternative is described below.

Alternative A (No Action)

Alternative A, which would continue sewerage service to the present sewered population but provide no new service or capital improvements, would have comparable impacts in 2005 as existing conditions. Combined sewer overflows would produce localized adverse impacts along Elliott Bay and Alki Point. Shellfishing areas at Alki would continue to show violations of bacterial standards in the water. Eelgrass beds at Alki, important in herring production and local fisheries, could be affected by CSO's and inadequate dilution at the existing outfall. In Puget Sound, the discharge of solids, metals, toxicants,and other materials would continue at present rates. Although effects,as measured to date,from present discharges have been very minor, the possibility of subtle, long-term impacts must be considered.

The site impacts at Alki would continue to affect the nearby residential areas. If uncontrolled, odors would exist during the planning period. Traffic from plant employees and sludge trucks would still pass through the neighborhood. However, the plant would not be expanded, so the ballfields would not be affected.

Alternative A would not comply with the secondary treatment requirements of PL 92-500, but the implementation of this alternative is not realistic. It is evaluated merely to show the consequences of no action.

Alternative B - (Metro Comprehensive Plan
No Action Pursuant to PL 92-500)

The only change in water quality at Alki relative to existing conditions would be better dilution and dispersal of primary effluent from the improved outfall. Since the discharge will likely be in mid-channel where mixing conditions should be improved, the possibility of solids, metals, pathogens or toxicants reaching the shoreline would be reduced. In addition, the more effective disinfection should benefit microorganism destruction and water quality near shellfishing areas. Combined sewer overflow would continue as today.

Site impacts at Alki would continue with the continued plant operation in a residential neighborhood. Traffic associated with plant personnel and sludge trucks would continue. Odor, unless controlled, would remain a nuisance at Alki. Recreational use of the nearby playing fields would not be changed.

This alternative does not comply with PL 92-500 requirements for secondary treatment.

Alternative C - (Major Combined
Sewer Overflow Controls)

Under Alternative C, the Alki plant would provide enhanced primary treatment during the summer season from 1983 to 1995. During this period, approximately the same total flow would be added as in Alternative B. The 20 percent reduction in organic materials, in solids, and associated metals, toxicants, and other components plus the improvement in the Alki outfall should be beneficial to the local beaches and intertidal areas, but these impacts would correspond closely with Alternative B. By 1995, the discharge of effluent from Alki would be eliminated, which should be beneficial to the local water quality.

The discharges from the new Duwamish plant, beginning in 1995, could have adverse effects on the Duwamish estuary, where 250 mgd peak would be discharged in storm periods. Since the Elliott Bay-to-Duwamish migratory fish route already receives municipal and industrial pollutants, Alternative C would intensify stress on these species. At Alki Beach, combined sewer overflow would be almost completely eliminated, a benefit to the intertidal areas and local beaches.

Because no substantial changes would occur at Alki before 1995, the site impacts would continue. Unless controlled, odor would remain a problem. Recreational use of the playing fields could continue. After abandonment, the Alki site could be converted to more compatible land uses.

At the Duwamish (Diagonal Way) site, socioeconomic impacts of constructing and operating the new plant will occur. A study of this area is in progress.

Alternative C does not comply with the PL 92-500 requirements for secondary treatment as currently written. Consequences could include fines and ineligibility for grant funding.

Alternative D - (Partial CSO Control)

The use of enhanced primary treatment at Alki, beginning in 1985 and continuing through the duration of the study period, would reduce solids and organics by 22 percent relative to Alternative B. Reductions in metals, pathogens, toxicants and other parameters would follow. The improved outfall and disinfection should result in better dispersion and reduced possibility of contamination along the beach. Combined sewer overflows at Alki Beach would decrease, but only by 18 percent.

At the Alki plant site, temporary disturbance would occur during dewatering activities plus extending the outfall. Otherwise the plant impacts would remain in terms of odor. Sludge truck traffic would decrease with the introduction of dewatering equipment to reduce sludge volume. The new construction would not affect the adjacent ballfields.

This alternative would not comply with the secondary treatment requirements of PL 92-500, with possible consequences on penalties and funding.

Alternative E -
(Secondary)

Implementing secondary treatment at Alki would reduce solids and organics loads to Puget Sound by over 70 percent at that location. Associated metals, pathogens, and toxicants would also decrease. Combined with the improved outfall and disinfection techniques, this alternative should substantially benefit local water quality, particularly in areas with shellfish and eelgrass beds. The magnitude of any changes in diversity, abundance, and composition in bottom communities should be less than may occur under Alternative B. The likelihood of contaminating shellfishing areas would be substantially reduced by improved effluent quality and dispersion. However, combined sewer overflow would continue as at present.

Construction impacts for new secondary aeration basins and clarifiers plus the improved outfall would be adverse but temporary. Since land for expansion is not available on the existing plant site, the new secondary facilities would require most of the land now occupied by one of the two adjacent ballfields. The impact on local recreation would be the loss of this ballfield. Unless controlled, the odors in the neighborhood around Alki would continue.

This alternative would comply with the secondary treatment requirement of PL 92-500. Timing requirements of the NPDES permit, dated June 14, 1977, include completion of the Facility Plan and EIS by June 30, 1978 followed by development of a compliance schedule for design and construction to meet the required 1983 date for completion of best practicable treatment facilities.

Alternative F -
(Secondary/Southern Strategy)

The principal impacts from this alternative would result from treating Alki area wastewater at a new Duwamish plant beginning in 1985. The secondary effluent from the Duwamish plant (45 mgd average, 145 mgd peak) plus the Renton plant (99 mgd average, 259 mgd peak) would then be discharged off Alki Point to Puget Sound through a new outfall. This discharge would be approximately 50 percent larger in terms of flow than the present West Point discharge. Information on existing conditions off Alki is limited, so more studies are needed before exact impacts can be determined there. A preliminary conclusion is that nutrients from secondary effluent could influence the size of plankton blooms near Restoration Point. The increase in nutrients and solids loads to Puget

Sound would be paralleled by increased loads of toxicants and heavy metals, perhaps of a similar magnitude.

Abandoning Alki in 1985 would allow the land to be converted to more compatible land uses. Until that time, impacts on the residential area from odors and traffic would continue.

At the Duwamish site, socioeconomic impacts have not been determined, but some work is in progress.

Alternative F complies with the secondary treatment requirement of PL 92-500. Timing requirements of the NPDES permit include completion of the Facility Plan and EIS by June 30, 1978 followed by development of a compliance schedule for facility design and construction.

Alternative G - (Secondary/West Point Phaseout Option)

Since the implementation of this alternative at Alki would involve the same facilities and service area as Alternative E, the impacts would correspond exactly with Alternative E.

Alternative H - (Deconsolidation/Reclamation)

Implementation of this alternative would require the same facilities for the Alki service area as Alternative E; thus, the impacts would be identical.

Mitigation Measures

Possible mitigation measures to alleviate or eliminate adverse impacts at the Alki plant site and service area plus the possible Duwamish plant sites include the following:

1. Instituting odor control measures at Alki in the near future regardless of other decisions on the wastewater facilities; costs of odor control measures expected by end of July 1977 from Metro (Alternatives B, C, D, E, F, G, and H).
2. Covering secondary clarifiers and constructing tennis courts to replace recreational use of one ballfield (Alternatives E, G, and H).
3. Conducting a comprehensive study off Alki Point to accurately determine existing water quality, biology, and currents before constructing a major new outfall there (Alternative F).
4. Landscaping the Alki plant site, particularly to screen views from above (Alternatives B, C, D, E, F, G, H).
5. Dewatering sludge on-site at Alki to reduce sludge truck traffic (Alternative B).
6. Operating chemical addition and enhanced primary treatment at Alki all year to reduce loads of solids, metals, and other parameters to Puget Sound (Alternatives C and D).
7. Obtaining an adequate data base in the Duwamish area to determine socio-economic impacts (Alternatives C and F).
8. Investigating new treatment plant locations in the Duwamish.

Unavoidable Adverse Impacts

The remaining impacts on water quality, biology, socioeconomics, sites, costs, energy and natural resources that could not be mitigated by the previously mentioned measures under each alternative would be unavoidable adverse impacts.

DESCRIPTION OF THE PROPOSAL

A. Name of the Proposal and Sponsors

This information is contained in the Introduction and in the Summary of Draft EIS Contents.

B. Location of the Project

The project location is described in Chapters I and III the Draft EIS.

C. Other Agencies File Numbers on Proposal

The reader is requested to contact Mr. Roger Mochnick (EPA), Mr. John McDonnell (DOE), and Dr. Peter Machno (Metro) for this information.

D. Identification of Construction Phasing and Future EIS Requirements.

Chapter III contains this information.

E. Description of Physical and Engineering Aspects of the Project.

These descriptions are summarized in Chapter III Draft EIS and are detailed in the Draft Facilities Plan.

F. Land Use Plans and Zoning Regulations

Chapter II of the Draft EIS describes existing and projected land use; Chapter III addresses whether the proposal is consistent with these regulations.

PREFACE

This Draft Environmental Impact Statement (EIS) evaluates the impacts of alternative wastewater facilities described in the Draft Facility Plan developed for the Municipality of Metropolitan Seattle (Metro). The alternatives include wastewater treatment plants, transfer interceptor sewers, combined sewer overflow control facilities and sludge handling facilities that would be constructed and operated by Metro. The major part of construction costs could be provided by grants from the Environmental Protection Agency (EPA) and the Washington State Department of Ecology (DOE).

The EIS has been prepared in response to federal and state legislation plus local resolutions requiring that EPA, DOE and Metro each fully consider the environmental impacts and consequences of alternative projects prior to making a final decision to proceed on a recommended project. The respective responsibilities for the three agencies in the EIS process were established for EPA in the National Environmental Policy Act (NEPA), 42 U.S.C. Sec. 4321, *et seq*.; for DOE in the Washington State Environmental Policy Act (SEPA) Chapter 43.21C RCW; and for Metro in Metro Council Resolution No. 2582.

In certain cases, significant environmental impacts could result from the various wastewater facilities alternatives. For example, alternatives for Metro's West Point, Alki and Carkeek Park wastewater treatment plants may have significant environmental impacts; similarly, an evaluation of facilities on a regional level indicated that some significant impacts should be considered. Therefore, a decision was made to prepare an EIS on these projects to comply with both NEPA and SEPA requirements. Rather than preparing separate EIS documents at the appropriate time, the three agencies agreed to prepare a joint EIS for the regional facilities alternatives, plus the West Point, Alki and Carkeek Park alternatives. In addition to satisfying both NEPA and SEPA with the joint EIS, the agencies also chose a procedure designed to eliminate delays and duplication of effort as well as to facilitate desirable interchange among the agencies and with the public during the early stages of the EIS process.

In another case, facilities would not cause significant environmental impacts as defined in NEPA. Therefore, an EIS, pursuant to SEPA (which would also serve as an environmental assessment), was prepared for the Richmond Beach site and service area.

Preface

For the total evaluation of the environmental impacts of alternative facilities plans, the environmental analysis has been organized as follows: Regional Analysis EIS (Volume I), West Point Treatment Plant EIS (Volume II), Alki Treatment Plant EIS (Volume II), Carkeek Park Treatment Plant EIS (Volume II), Richmond Beach Treatment Plant EIS (pursuant to SEPA) (Volume II). Each site-specific document (Volume II) is intended to be read with the regional analysis (Volume I), with each such pair constituting a complete EIS.

The production of this joint Draft EIS results from close cooperation between EPA, DOE, and Metro. All three agencies have been intimately involved with the review, analysis, supplementation, and synthesis of materials furnished by independent consultants hired to assist with the preparation of the EIS. The City of Seattle, King County, and the Puget Sound Council of Governments have also participated in meetings and provided comments on preliminary draft materials to ensure that local government concerns and regional land use planning goals were incorporated in the EIS.

EPA regulations on "Preparation of Environmental Impact Statements" (40 CFR Part 6; 40 FR, April 14, 1975), Council on Environmental Quality Guidelines for the "Preparation of Environmental Impact Statements" (40 CFR Part 1500; 38 FR 20550, August 1, 1973), and the EPA "Manual for Preparation Works, Facilities Plans, and 208 Area-wide Treatment Management Plans" (July 1974) have been used in preparation of the EIS. Likewise, SEPA Guidelines, adopted by the State Council on Environmental Quality and incorporated by Metropolitan Council Resolution No. 2582, have been followed insofar as they are consistent with federal requirements.

Some of the alternatives described in the Draft EIS's and Draft Facility Plans include the provision for secondary treatment at Metro facilities by 1985. The twenty year planning period is from 1985-2005. These 1985 dates are not consistent with the current PL 92-500 requirement for Best Practicable Treatment including secondary treatment by 1983. According to the facility planning engineers, the 1985 date may be more realistic than 1983 due to delays in the Step I (planning process), and, thus, in the start dates for Step II (design) and Step III (construction).

However, since the law currently requires Best Practicable Treatment by 1983, the construction schedules will be changed to reflect this. Due to time constraints, it was not possible to change the dates in the Draft Plans and EIS's. The reader should note that any mention of secondary treatment in 1985 will be changed to 1983 in the Final Plans and EIS's. The twenty-year planning period also changes to 1983-2003.

These changes may impact the analysis of alternatives in several minor ways. First, there is a potential for a slight saving in costs, due to the decrease in inflation associated with an earlier start date. However, the need for this earlier start date compresses the design and construction schedules causing an increase in these costs. The two factors, one a potential savings and one an increase in costs, will probably negate one another.

The new planning period, from 1983-2003, will cause population projections and solids loading to decrease slightly. This decrease, estimated at 2 percent, is well within current sensitivity of the projections and should not have a noticeable impact on the analysis.

All comments on this Draft EIS should be sent to the EPA as the lead agency in the EIS process. Comments should be addressed to Mr. Roger Mochnick, Environmental Evaluation Branch, Environmental Protection Agency, 1200 Sixth Avenue, Seattle, Washington, 98101. The EPA will then distribute copies of the comments to DOE, Metro and the EIS consultant. Comments will be used by the three agencies in preparing the Final EIS and in their decision-making processes.

It is believed that this process best enables the agencies involved to fully assess and consider all significant physical, economic, and social effects of their proposal, and public input thereon, prior to any significant decision-making step. For this reason, the agencies have not attempted to bias the decision to be reached by recommending any one of the eight alternatives prior to full completion of the EIS process, including the public hearings. Rather, the attempt of this document is to present the decision makers and the public with as complete an analysis as possible of each of the alternatives so that a fully informed decision can be made.

The remaining part of the decision-making process will proceed under the following schedule:

October 25, 1977	Public hearing on Regional Draft EIS
October 27, 1977	Public hearing on Alki Draft EIS

November 1977	A preferred alternative is recommended by Metro in conjunction with EPA and DOE
February 1978	Final EIS is available
March 1978	Public hearings on Final EIS
April 1978	Metro Council decision
April 1978	DOE decision
April 1978	EPA decision

CHAPTER I

BACKGROUND

The Alki wastewater treatment plant is one of five Metro treatment plants that will be affected by the wastewater management alternatives being considered in the 201 Facility Plan. Figure 1-1 shows the treatment plants' locations and the service areas tributary to each. This report, Volume II, presents the impacts of these alternatives on the Alki service area and its environment. Impacts of the alternatives on the regional level and a background of the regional issues are discussed in Volume I.

The Alki treatment plant services approximately 4,100 acres adjacent to Puget Sound. This includes the west side of the West Seattle residential area and extends south to include the Fauntleroy area. The tributary area is almost entirely residential, producing normal domestic sewage with no appreciable industrial load.

The treatment plant was constructed by the City of Seattle in 1958. It was designed for a dry weather flow of 10 million gallons per day (mgd). The combined collection system is subject to high inflow and infiltration during storms. The design peak wet weather flow for the treatment facility is 30 mgd; flows in excess of 30 mgd are bypassed directly to Puget Sound along the shoreline near Alki Point and the Duwamish. Treated effluent is discharged to Puget Sound 1,300 feet offshore through a 42-inch diameter submarine outfall at a depth of 79 feet below mean sea level. The Alki outfall is judged to be inadequate in having no diffuser section and discharging into shallow water near shore. The solids are digested on site and trucked in liquid form to the Cedar Hills landfill for final disposal.

At present, nine operating personnel are required to staff the facility which has an operating cost of $378,000/yr. Traffic generated by plant operation amounts to nine round trips/day in addition to 1.7 round trips/day for sludge trucks.

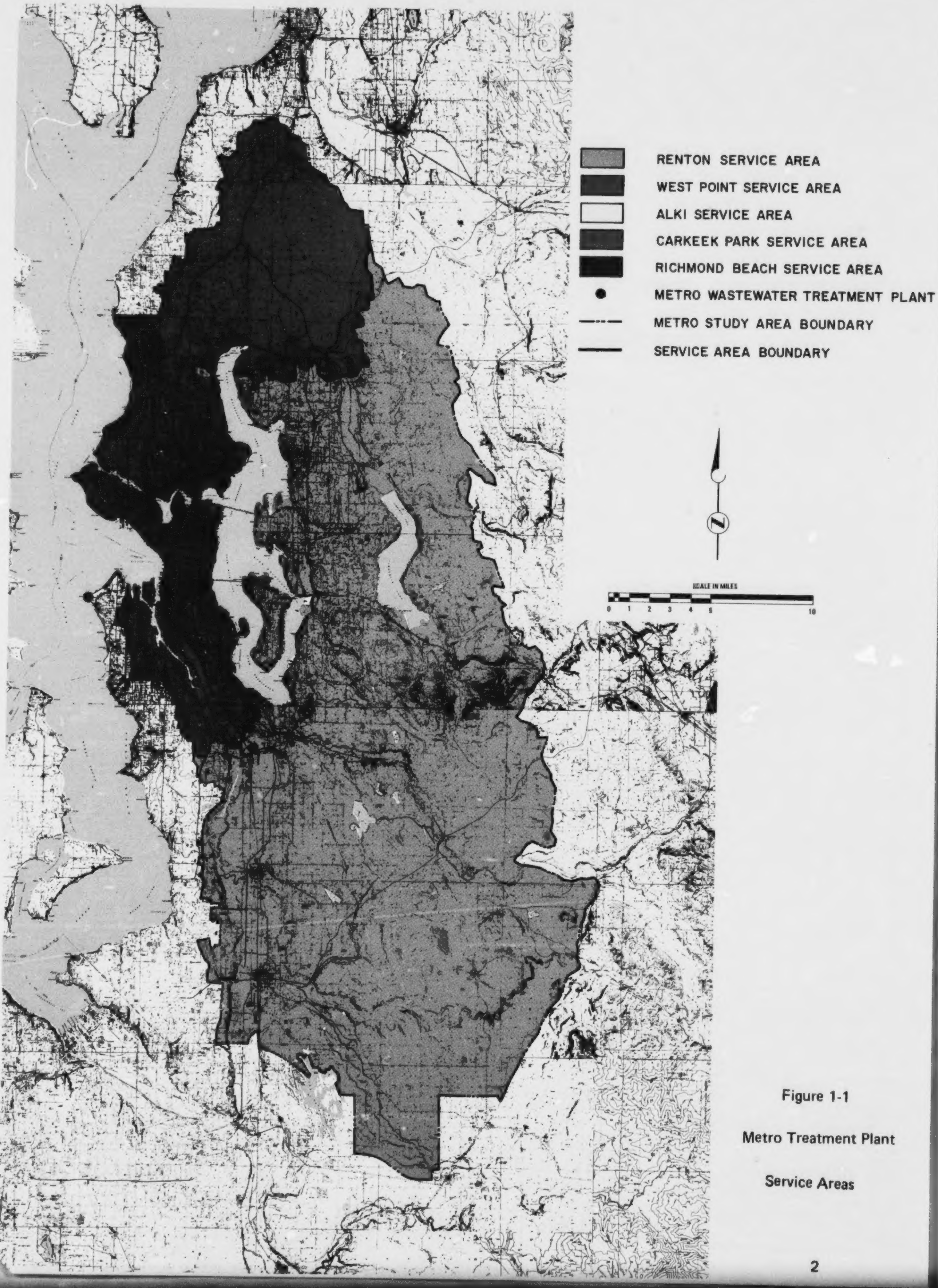
RENTON SERVICE AREA
WEST POINT SERVICE AREA
ALKI SERVICE AREA
CARKEEK PARK SERVICE AREA
RICHMOND BEACH SERVICE AREA
METRO WASTEWATER TREATMENT PLANT
METRO STUDY AREA BOUNDARY
SERVICE AREA BOUNDARY
N
SCALE IN MILES
0
1
2
3
4
5
10

Figure 1-1

Metro Treatment Plant

Service Areas

Background

More detailed descriptions of the service area and treatment facility are included in Chapter III under the "No Action" alternative.

SITE CONSTRAINTS AND ISSUES

The immediate proximity of residences to the Alki treatment plant places severe constraints on plant operations and expansion. An aerial view of Alki is shown in Figure 1-2.

Light onshore breezes carry odors directly onto neighboring properties, triggering complaints from local residences. Based on comments at public meetings and workshops, the odor near Alki is frequent and is a major concern of residents. Metro has taken steps to reduce the odor by operating afterburners. Other odor control measures will be evaluated and priced near the end of July 1977.

The site is presently too small for parking and materials storage. Access to the plant is along a narrow unpaved road through residential areas. The road is not wide enough for necessary truck maneuvers, and any increase in sludge hauling traffic would increase traffic through the neighborhood.

Any expansion or upgrading at the site would consume a part of one, and possibly two, baseball diamonds which constitute the neighborhhod park. The site rests on solid bedrock, necessitating explosives in excavation for new facilities.

The nearby discharge of fecal coliform bacteria during wet weather overflows or inadequate diffusion at the outfall results in bacterial concentrations in waters along the beach that exceed some public health limits for shellfishing and may limit water contact recreation there.

To alleviate the site constraints cited above, abandonment of the Alki treatment site was considered in two of the regional alternatives evaluated in the Draft Facility Plan. Alternative sites for both a wet weather treatment plant and secondary treatment plant were considered in the lower Duwamish area. An aerial view of the Duwamish area is shown in Figure 1-3.

The favored site for the wet weather treatment facility would be at Diagonal Avenue where an abandoned treatment plant still stands. The land available there could accommodate the wet weather plant size. However, the site is directly across the river from a recently discovered archeological site. Although no survey has been made of the site it is considered to

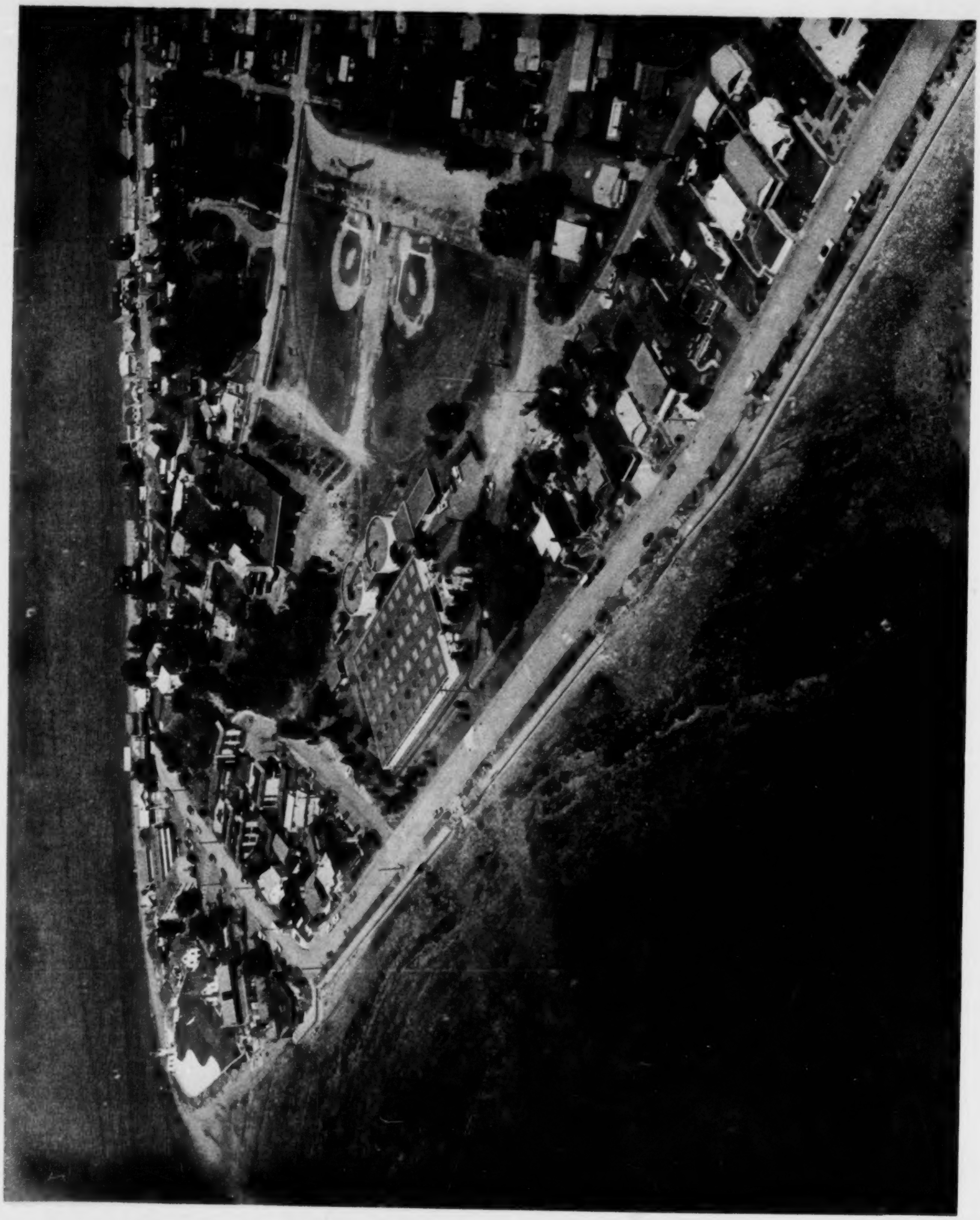

Figure 1-2

Aerial View of Alki — — Looking in Northerly Direction

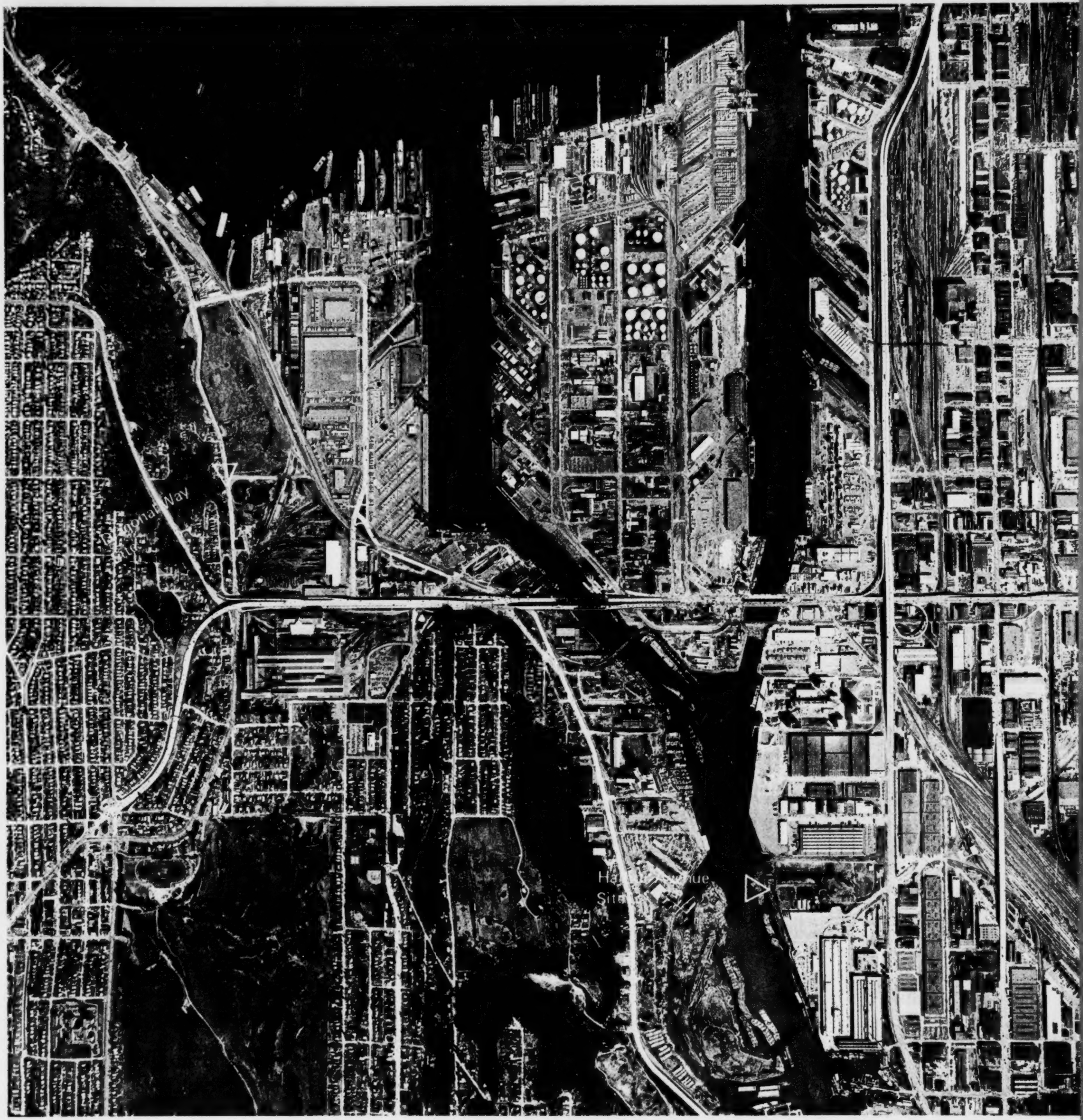
Diagonal Way
Site
Harbor Avenue
Site

Figure 1-3

Aerial View of Harbor and Diagonal Avenue Sites have high potential for archeological resources. As a result, less favored optional sites, at South Park and the Duwamish West Waterway near the river mouth, may receive more serious consideration. These two sites, however, are built on sanitary landfills, and piling would be required for supporting all structural foundations. In addition to the foundation problems, the sites located on sanitary landfill are prone to gas problems generated from organic matter decomposition.

Another site being considered in the lower Duwamish area for the dry weather plant would be at Harbor Avenue S.W., where sufficient land would be available for the larger, secondary treatment plant. Again, it is believed that piling will be required for the support of all structural foundations.

Socioeconomic studies of the sites were not made, and the opinions of the general public as well as the industrial interests in the area on the use of these sites have not yet been solicited. Metro staff is currently investigating the Duwamish area in more detail, and the City of Seattle is independently evaluating alternative sites.

At public workshops and community meetings, Alki residents complained of odors, did not feel that current odor control measures at the plant were successful and asked for a clarification of the ownership of the ballparks. Residents also questioned the effectiveness of the City of Seattle "Forward Thrust" sewer separation program and the wisdom of allowing in the past combined sewer overflows adjacent to public beaches. It was pointed out that the storm sewer outfall south of the plant blocks pedestrian use of the beach by a stream of effluent.

Questions relating to regional issues were raised about the natural flushing ability of Puget Sound, the fate of heavy metals, the reasons for delay in adopting secondary treatment, and the rate of inflation used in the cost projections.

The citizens expressed a desire to have a voice in the design process and to have the plant moved if this could be done without incurring costs substantially higher than that for plant improvements at Alki. Priorities for on-site improvements included controlling odors, avoiding removal of houses or the ballfield, construction additions over the road toward the shore or under the ballfield, or designing the plant site for multiple use (such as recreation). Other comments concerned options on the ballfield, federal funding limits, and the effect of plant expansion on property values.

Background

An additional public workshop was held in June to inform citizens of the eight proposed alternatives and solict their comments on the site-specific impacts of each. Site concerns were the same as expressed at earlier meetings (odors, property values, baseball field), but the citizen sentiment was that these concerns had been made known to Metro before. Interest in regional issues was apparent by remarks on water quality and impacts at a Duwamish site. Public hearings on the Alki site and regional issues are planned for October-November.

CHAPTER II

EXISTING ENVIRONMENTAL CONDITIONS

The following description of the environmental setting at Alki and its potential alternative sites in the Duwamish Valley is divided into the following categories for analytical purposes: physical, biological and human. It is recognized that the three overlap, but this artificial division ensures a thorough analysis of relevant impacts. Emphasis is placed on treatment plant sites, surrounding service areas, and adjacent Puget Sound Waters. Additional information is provided in the regional analysis which is Volume I of this series. A list of the elements of the environment to be treated in this document is appendixed, as required by SEPA.

The Alki service area is approximately 6.4 square miles, as indicated on the map of Figure 1-1. The area is a predominately single-family residential area. It is one of the older, more developed areas of Seattle.

THE PHYSICAL ENVIRONMENT

The following describes topography, geology, soils, seismicity, climate, air quality, hydrographic features and water quality (Metropolitan Engineers, Alki Facility Plan, 1977).

Topography of the Alki Site

The Alki service area rises from Puget Sound in the west and Elliott Bay in the north to elevations exceeding 400 feet. Steep bluffs are found in the Duwamish Head area and in various locations south of Alki Point above the shoreline of Puget Sound. Longfellow Creek follows a northerly course toward Elliott Bay cutting a moderately incised valley about three miles in length. Much of the Alki service area slopes, a factor which influences peaking factors in combined sewer and

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urban drainage flows.

The Alki plant is situated in a primarily residential area on a virtually level plateu approximately 5 feet higher than, and parrallel to, Beach Drive, S.W., immediately adjacent to the west. Two small ballfields are located to the northeast bordering the plant; the ballfields, a part of the Bar S playground, are approximately ten feet higher in elevation. Residences at the east and north sides of the ballfields are approximately 5 feet below the ballfields. The plant and ballfields lie at the base of a rocky hill to the north/northwest. The ballfields were constructed of cut material from the hill and the plant site. Metro has an option to purchase the adjacent playfield which is owned by the City of Seattle.

Geology and Soils at Alki

The predominant soils of the Alki service area are Vashon till (well-consolidated clay, silt, sand, and gravel of glacial origin) and undifferentiated pre-Vashon deposits (till, outwash and interglacial deposts). The only non-glacial material found in the service area is located at Alki Point where Oligocene sedimentary rocks are exposed. They consist of well-cemented marine siltstones and mudstone with some graywacke sandstone and conglomerate beds.

Soils in the upland areas contribute to variable runoff characteristics as infiltration is very slow, and undrained or poorly drained depressions are common. Permeability is low in all areas except within the outwash deposts. Being dense and cohesive, excavation of these soils is difficult by hand or with light power equipment.

When the southwesterly half of the Alki treatment plant site was excavated, bedrock was encountered. It is believed that the bedrock can be ripped off with heavy construction equipment if the required excavation is not very deep. However, present information is insufficient for making any conclusive recommendations. For the purpose of foundation support evaluation, the physical properties of both the bedrock and the overlaying soils should be established, and the surface contours of the bedrock should be identified.

Seismology at Alki

Relative to other areas in metropolitan Seattle, West Seattle sustained more serious damage during the 1965 earthquake. Structural damage to older brick buildings and chimneys was common. This was thought to be the result of vibration of the well-consolidated Pleistocene deposits which exist there, rather than faulting or subsidence.

Earthquake hazard is a function of soil type in the Puget Sound region. At Alki, structures on Alderwood and Everett soils would experience an earthquake of magnitude VII (Modified Mercalli Scale) one to five times in 133 years. Seismic risk is moderate, such that before building at this location, further study of near surface conditions is required to plan construction.

Duwamish West Waterway Site Geology and Soils

The Duwamish West Waterway site was filled to its present elevation with sanitary waste and other earth fills, resulting in little uniformity. Though surface fill averages 20 feet in depth and is heterogeneous, investigations have not encountered gas problems. Soil conditions demonstrate the need for piling to support all structural foundations. Seismic hazard risk is probably moderately high as fill is unstable and likely to transmit long wave vibrations (Rasmussen et al., 1974).

South Park Site Geology and Soils

The South Park transfer station site lies in the former Duwamish river floodplain and delta. It was filled to present elevation with sanitary waste and other earth fills. It averages 20 feet in depth and is expected to have little uniformity. A detailed soil study is necessary to determine specific engineering procedures in developing the land. Previous soils investigations did not encounter gas problems in the fill. The surface fill was underlain by soft silt, peat and very fine sand, which were in turn underlain by black medium compact to compact fine to fine-medium sand. Groundwater level fluctuated between elevations 3 and 7, being higher during the winter months. Seismic hazard risk is high for these loose, unstable soils (Rasmussen et al., 1974).

Piling will be required for supporting all structural foundations. Treated timber piles or prestressed reinforced concrete piles shall be used for design estimates, with a bearing capacity limited to 25 tons and 50 tons respectively. Excavation below the groundwater level will require dewatering, which can be accomplished by using wells or well points.

Diagonal Avenue Site Geology and Soils

The Diagonal Avenue site is situated in the former Duwamish slough meandering area. Before being filled, the old slough channel bottom varied from approximately elevation -7 to elevation 1. The slough bank was generally at elevation 4 to elevation 6. In developed areas, the ground surface is raised by fill to about elevation 12.

Previous soil borings in the vicinity reveal that the site is underlain by alluvial deposits over 100 feet thick. The surface fill is generally dredged fine sands, ranging from silty very fine sand to fine medium sand. Below the surface fill, soft silty and peaty soils are found. Seismic hazard risk is high for these soils. Piling will be required for support of all structures at this site (Metropolitan Engineers, Alki Facility Plan, 1977).

Groundwater was observed to be at elevation 2, but fluctuates with tide. Dewatering is necessary if excavation extends below the groundwater level.

Harbor Avenue S. W. Site Geology and Soils

The Harbor Avenue S.W. site is located to the east of Harbor Avenue S.W. and to the west of the Duwamish West Waterway, at the mouth of the Duwamish River adjacent to the West Duwamish valley wall. Soil conditions at the site vary depending upon the distance from the valley wall, the nature of surface fill, and the meandering characteristics of the Duwamish River.

Valley margin sediments of late Vashon and recent age include sand, gravel and silt, deposited as slope wash and/or with shells and wood in an intertidal zone. These sediments are derived predominately from older reworked deposits and, in general, immediately overlie eroded preconsolidated silt and clay, in relatively thin layers. These sediments are generally medium dense or moderately firm in consistency.

In general, it is believed that piling will be required for the support of all structural foundations. Soils investigations will be necessary for the evaluation of foundation supports at specific locations.

Existing Environmental Conditions

Seismicity of Alternative Sites

As all of the alternative sites involve fill and some high water table elevations, they carry a high seismic hazard risk. Rasmussen *et al.*, 1974, suggest that "one should not build at this location unless the structure is specifically designed to take into account substantial shaking and possible soil failure." Since the entire downtown area of the City of Seattle is built upon incongruous fills the placment of a wastewater treatment facility on fill would not be an exceptional case.

Puget Sound Sediments Off Alki Point

The Puget Sound Interim Studies (PSIS) indicated apparent changes in the organic content, grain size and appearance of marine sediments in the characteristic plume position for West Point (Harmon *et al.*, 1976). As current conditions and physiographic features at Alki are like those at West Point, similar effects are assumed to occur. Both West Point and Alki Point jut westward into the main basin of Puget Sound and develop eddies to the north and south as a result of tidal water movements (Duxbury, 1976).

Climate and Air Quality at Alki

With an average of 34.35 inches per year (1964-1972), the Alki treatment plant experiences relatively low annual rainfall compared to most of the Metro area. Refer to the Regional Analysis for a more detailed discussion of climate.

Air masses flow in a southerly direction paralleling the axis of Puget Sound from April to September, increasing in average speed and reversing direction for the remainder of the year. These conditions result in good ventilation of the Alki service area. Air quality in the Alki service area tends to be somewhat better than in some of the more confined airsheds within the Metro study area (e.g., Duwamish, Interbay, Lake Union). Air masses which pass Alki Point have been traveling a considerable distance over open water with little topographical restriction. Ample mixing of this air occurs as lateral mixing is unrestricted. The service area is also insulated topographically from the industrialized Duwamish airshed.

Odors at Alki

In Summer of 1976, the Puget Sound Air Pollution Control Agency and Metro received complaints about offensive odors generated by the Alki treatment plant. Almost immediately Metro instituted remedial measures including increasing chlorination, modifying the waste gas burner, adjusting the boiler, and improving overall plant housekeeping. The odor problem was apparently not overcome, as citizens of the service area complained of odors at a public meeting in the Fall of 1976.

Plant odor continues to be locally noticeable, depending on wind direction, cloud cover, and similar factors. Area residents state that odor is more noticeable at low tide, a phenomenon with several possible simultaneous causes. Firstly, the odor of wet tidelands (which may have anaerobic sediments) is blown over the plant by southwest winds. Secondly, the beaches at Alki are subject to a major combined sewer overflow (100+ mil gal/yr) containing raw sewage and street runoff. The materials contained in this flow may settle in the in tertidal or just subtidally to be uncovered by a low tide although a local diver has seen no sign of deposition in this area (DOE comment, 1977). Thirdly, the Alki outfall is judged to be inadequate in having no diffuser section and discharging into shallow water nearshore. Initial dilution is estimated at 10:1. Examination of current and eddy patterns at Alki suggests that effluents of low dilutions reach the shore as at West Point but probably with greater frequency.

Climate and Air Quality in the Duwamish Valley

The Duwamish Valley extends north and south between 300-foot high hills, opening onto Elliott Bay in the north and the Green River Valley on the south. Low elevation mixing air is confined by bordering hills and bluffs. Entrapment occurs when the wind accumulates pollutant loads as it passes over urbanized Seattle and then moves into the corridor, where there is little or no air mixing because of the trap caused by the 300-foot high hills. Inversions occur frequently in the Duwamish area.

For this corridor, different amounts of emissions are found for northerly and southerly winds, because there are different pollutant sources from each direction. When compared with other sites, the Duwamish appears to receive the most pollutants from outside its borders and generate the most within its borders. It does not meet any of the standards set by the Puget Sound Air Pollution Control Agency. Pollutant concentrations in the Duwamish area are given in Table 2-1.

Water Resources

Water resources are described in terms of hydrographic features, marine water quality and groundwaters.

Hydrographic Features

The principal hydrographic features in the Alki service area are Elliott Bay to the north and central Puget Sound to the west. There are approximately nine miles of marine shoreline within the service area. In both Puget Sound and Elliott Bay the bottom drops sharply to depths exceeding 300 feet, generally within one-half mile of the beach. There are no major freshwater bodies located within the service area.

Water Quality: Puget Sound Nearshore and Intertidal Waters

As indicated in the Regional Analysis and in the Puget Sound Interim Study Report for the Municipality of Metropolitan Seattle, the water quality of the central Puget Sound basin is generally quite good. In the marine waters adjacent to the Alki service area, however, there are two conditions which could potentially adversely affect the quality of Puget Sound waters, namely the inefficiency of the Alki treatment plant outfall and the occurrence of periodic combined sewer overflows (CSO's) along Alki and West Seattle beaches.

Outfall performance. The Alki Point outfall is 42 inches in diameter, extends some 1,300 feet offshore and terminates as an open-ended pipe. It discharges wastewater horizontally at a depth of about 80 feet. The operation of the outfall is considered to be inefficient as a result of

Table 2-1

Summary of Pollutant Concentrations
(Micrograms per Cubic Meter)

	From Outside Service Area	Generated Within Service Area
Sulfur Dioxide		
Duwamish	208	522
PSAPCA Standard: 230 for 24-hour average		
Nitrogen Dioxide		
Duwamish	160	886
PSAPCA Standard: 100 for annual average		
Particulates		
Duwamish	100	339
PSAPCA Standard: 150 for 24-hour average		
Hydrocarbons		
Duwamish	UKN	1,726
PSAPCA Standard: 160 for 3-hour average		

poor initial dilution (10:1) and shallow discharge depth. An oceanographic survey in the Summer of 1974 observed an effluent bubble directly over the discharge point. Based on tidal current patterns at Alki Point shown in the Puget Sound physical model, it is quite probable that effluent reaches the shore with some regularity. Defining the extent of this problem is complicated by the fact that Alki/West Seattle waters also experience combined sewer overflows of some magnitude and frequency during wet weather conditions. The source of the fecal coliform bacterial levels exceeding State shellfish production standards has, therefore, not been identified. Annual overflow volumes are approximately equivalent to half a day's flow from the Alki facility, however. The effects of the Alki outfall on other water quality indices were barely measurable except for turbidity (Environmental Quality Analysts, 1975). It has been demonstrated, however (Smith, 1976),that substantial biological changes may occur in the absence of measurable water quality alterations. If the Alki plant continues to operate, improvements to the outfall should be made, including extending the outfall into deeper water and the addition of a diffuser section.

Combined sewer overflows. The Alki service area includes many areas which are served by combined sewers; although many of the area's sewers have been partially separated by removing street drains, roof and yard drains are still connected to sanitary sewers. As a consequence, the sewers and pumping plants overflow along the shoreline area during wet periods. The NPDES permit for the Alki service area lists ten potential overflow locations (see Appendix C). Annual volumes total about 5:5 million gallons, annual soild loads, 5 tons, and BOD, 1.4 tons. The frequency and volume of combined sewer overflows at these locations are quite variable. While overflows have not been sampled in this area, it is possible that the overflows which originate in primarily residential areas may lack some of the toxic elements which are introduced into the Duwamish via CSO's; however, bacteria and virus contaminants from fecal matter would be present. One of the largest overflows is at Alki Point, which appears to empty directly onto the beach or into nearshore water.

The effect of overflows on the marine environment depends partially on the frequency and volume of the overflow. Infrequent overflows of short duration would cause a temporary disturbance to the marine habitat with respect to BOD, suspended soils, temperature, salinity and nutrients. Even short duration overflows from residential areas may contain heavy metals, toxicants and pesticides washed from the streets, however, subjecting marine organisms to "shock loads" or "plugs" of untreated wastes which tend to persist. The effects are minimized by efficient mixing. Frequent overflows of long duration carry larger overall loads of contaminants, although the waters may be more dilute.

Bacteria and viruses can increase in the receiving waters to be filtered out and concentrated in shellfish and some crustaceans to levels many times those in the water. The intensive recreational shellfish harvesting use of Alki-West Seattle beaches makes nearshore CSO's a serious concern. No data were available during the facility planning study on the impact of Alki area overflows; however, monitoring of offshore waters and shellfish is to occur in 1977. Data gathered at 40 of Metro's Puget Sound shoreline monitoring stations in 1976 indicated that none of the nearshore waters in the study area met state fecal coliform standards for commercial shellfish, however. While health warnings have not been posted, the Seattle-King County Health Department discourages consumption of shellfish taken from these beaches.

Eddy currents. The current regime in the immediate vicinity of Alki Point probably works against efficient mixing and rapid dilution of outfall effluent and overflows when they do occur. Alki Point itself, much like West Point, generates large eddies as tidal currents oscillate back and forth along the north-south axis of the Sound. Past current studies have shown that on an ebb tide, an eddy develops to the north between Alki Point and Duwamish Head. On a flood tide, eddies develop both north and south of the point. Water masses more than 1,500 feet offshore do not seem to be deflected by the point. Plotted travel times to shore from various locations off Alki show that times to shore from equal distances offshore are considerably greater for locations southwest of the treatment plant site (observed travel times ranged from 1 to 5 hours).

More recent studies using the Puget Sound physical model show an additional eddy south of the point during major ebb tides. Furthermore, it appears that horizontal mixing is at a maximum during slack water periods when eddies predominate. Horizontal mixing is at a minimum during peak ebb and flood periods when more uniform flow predominates. It is during these periods that discharged effluent is most likely to reach the beach. No information has been collected, however, on the actual disposition of the Alki effluent.

The improvements to the outfall proposed in most of the facilities planning alternatives should be preceded by studies of the plume, the circulation in the vicinity and the biota in areas reached by effluent. For more detailed discussion of water quality and ecology for the central Puget Sound basin as a whole, refer to Chapter II of the Regional Analysis.

BIOTIC ENVIRONMENT

The habitats of interest in this document at the treatment plant site and service area are suburban terrestrial and park areas, and the waters of Puget Sound off the Alki service area.

Terrestrial Ecology

As a fully-developed residential/commercial area, the Alki service area has only limited value for wildlife. Lawns, ornamental shrubs and trees, gardens,and small patches of natural vegetation provide habitats for those species of birds and small mammals which tolerate high levels of human activity. Robins, sparrows, starlings and squirrels are common in these areas.

The habitats are found in the large parks - Lincoln Park and Schmitz Park - where a diversity of vegetation encourages a wider variety of birds and small mammals.

The Alki treatment plant site itself is situated in a residential area on the south shore of Alki Point. The area has been extensively developed and vegetation is limited to landscaping about the site, the ballfields to the northeast and limited amounts of brush. As the diversity of terrestrial animals correlates closely with the diversity of plants, these areas are expected to have little wildlife.

A more complete discussion of these effects and a list of animals common in the Metro area is included in the Regional Analysis which is Volume I of this series.

Marine Habitats

The waters off the Alki service area support communities of invertebrates, finfish and marine plants. Figures 2-1 and 2-2 portray the types of intertidal and subtidal environments and representative biological communities found in the marine waters adjacent to the Alki service area.

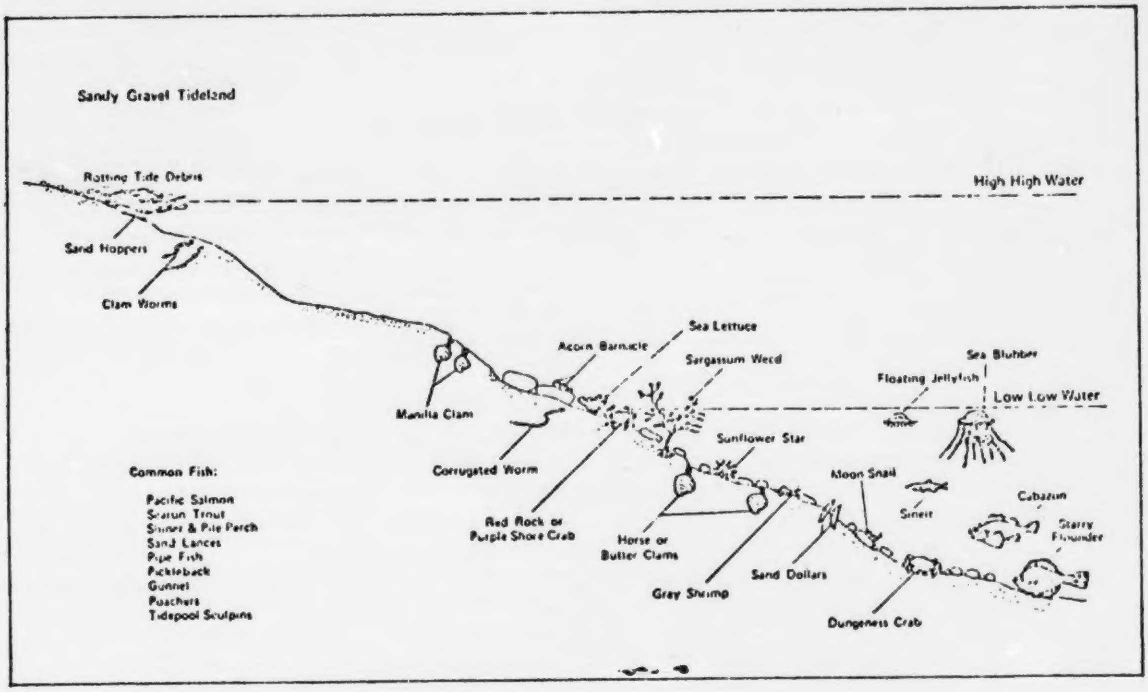
Sandy Gravel Tideland
Rotting Tide Debris
High High Water
Sand Hoppers
Clam Worms
Manilla Clam
Acorn Barnacle
Sea Lettuce
Sargassum Weed
Sea Blubber
Floating Jellyfish
Low Low Water
Corrugated Worm
Sunflower Star
Moon Snail
Smelt
Cabazon
Starry Flounder
Red Rock or Purple Shore Crab
Horse or Butter Clams
Gray Shrimp
Sand Dollars
Dungeness Crab
Common Fish:
Pacific Salmon
Searun Trout
Shiner & Pile Perch
Sand Lances
Pipe Fish
Pickleback
Gunnel
Poachers
Tidepool Sculpins

Fig. 2-1 Sandy Gravel Tideland

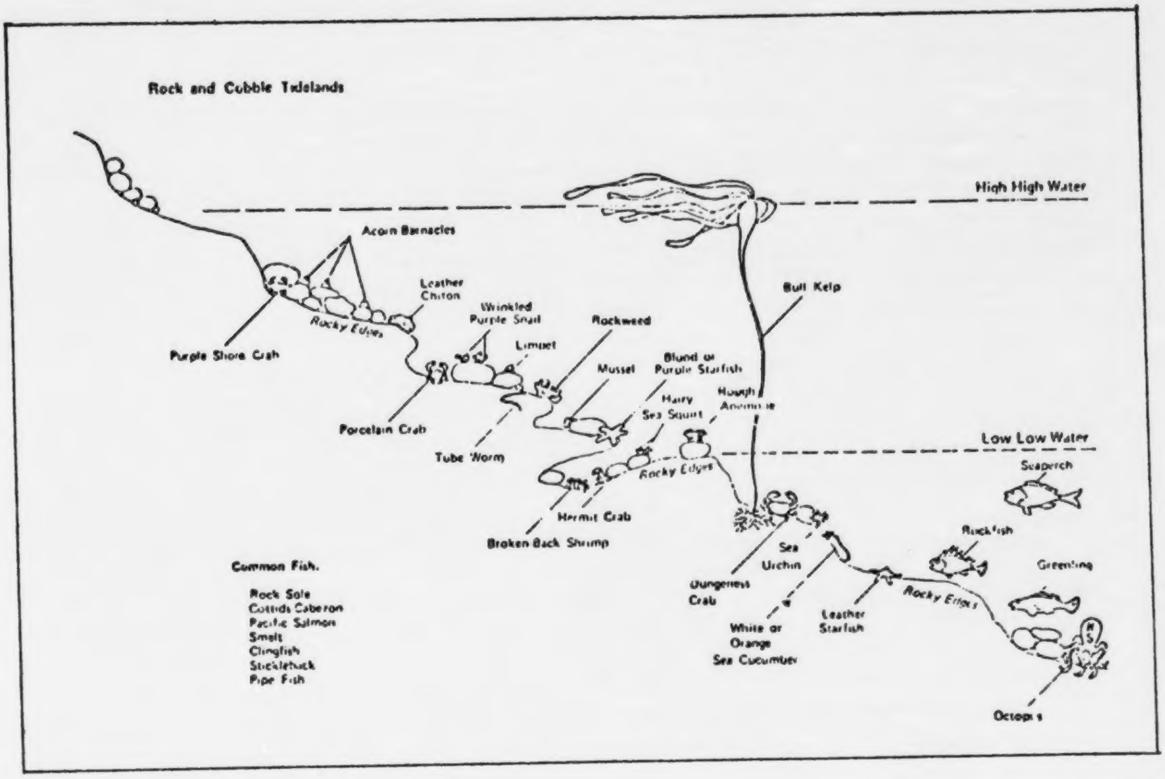
Rock and Cobble Tidelands
High High Water
Acorn Barnacles
Leather Chiton
Wrinkled Purple Snail
Rockweed
Bull Kelp
Purple Shore Crab
Rocky Edges
Limpet
Mussel
Blood or Purple Starfish
Hairy Sea Squirt
Rough Anemone
Porcelain Crab
Tube Worm
Low Low Water
Seaperch
Rocky Edges
Hermit Crab
Broken Back Shrimp
Rockfish
Greenling
Sea Urchin
Dungeness Crab
Common Fish.
Rock Sole
Cottids Cabezon
Pacific Salmon
Smelt
Clingfish
Stickleback
Pipe Fish
White or Orange Sea Cucumber
Leather Starfish
Rocky Edges
Octopus

Fig. 2-2 Rock and Cobble Tideland

Existing Environmental Conditions

In a Metro-sponsored study of five Puget Sound beaches, investigators from the College of Fisheries at the University of Washington identified 96 and 100 different species of attached marine flora at Alki and Lincoln Park beaches, respectively. Species diversity at these locations was greater than at West Point (90 species), Richmond Beach (75), and Carkeek Park (68) beaches. A survey of macrofauna (Chew et al., 1976) identified 190 species at Alki Beach and 211 species at the control area in Lincoln Park in West Seattle. These numbers differed little from those recorded at Carkeek Park, West Point, and Richmond Beach. The diversity and abundance of biota appear to indicate that Alki service area beaches are generally healthy. Biota at sewer overflow points has not been examined, however, nor have the levels of toxicants they contain. It has also been suggested that these beaches are merely equally stressed.

The beaches are popular clamming areas, with hardshell clams and geoducks of particular interest. Washington State Department of Fisheries sport shellfishing surveys indicate that on an annual basis total user days for Alki-West Seattle beaches is on the order of 7,250.

Of particular importance are the extensive eelgrass beds which are found in the shallow waters off Alki. These beds provide protection for Dungeness crabs as well as important spawning and nursery grounds for herring and perch. A small herring fishery located between Alki Point and Duwamish Head supplies bait for the local sport salmon fishery. Average annual production over the 1966-1970 period was just under 46,000 pounds.

The biota in the waters off Alki and West Seattle has long attracted the attention of divers and the area is one of the most popular diving areas in the metropolitan Seattle area. In some locations, wrecks have been sunk to provide artificial substrates for invertebrates and to attract fish.

In 1971, a visual inspection of the Alki outfall and immediate vicinity was made by submarine. The biota observed appeared to be abundant and healthy. It should be noted, however, that current disinfection practices result in occasionally high levels of chlorine residuals in the effluent. According to an EPA report (Brungs, 1976), these residuals may be toxic to a wide range of marine organisms at very low levels. The effects of such residuals upon the biota near the Alki outfall are not known, although it may be that the species of fishes and invertebrates observed represent more tolerant species. More detailed discussion of effluent toxicity and disinfection is included in Chapter II of the Regional Analysis.

Existing Environmental Conditions

In a Metro-sponsored survey of demersal fishes in the central Puget Sound basin, sixty-five species were collected off Alki Point using beach seines and otter trawl gear. Species most frequently caught - 77 percent of catch - using beach seines were shiner perch, striped seaperch and tube-snout. The abundance of adult and juvenile perch collected suggest that the eelgrass beds serve as important nursery areas for these species. Ratfish, striped seaperch, English sole and rock sole accounted for nearly half (47 percent) of the fish caught by otter trawl. Commercially valuable side-striped shrimp were common at depths below 200 feet with pink and coon-striped shrimp and spot prawns also present.

Nematode infestation (Philometra) of fish was generally high throughout the year, ranging from 10 to 40 percent in English sole and 3 to 18 percent in rock sole. Fish under six inches in length were consistently free of nematodes. There is no apparent relation between nematode infestation and Metro outfalls, as high incidence rates were observed along a north-south axis from West Point to Alki to Point Pully and south. This phenomenon has been noted elsewhere. Based upon small sample sizes, the incidence of tumor-bearing fish was low. No evidence of fin erosion was observed in the fish sampled.

NATURAL RESOURCES AND ENERGY

Natural resources and energy impacts are not analyzed on a site-specific basis. Resources and energy consumption occurs on an interrelated basis at the five existing Metro plants and potential new sites. Rather, these considerations are analyzed in the Regional Environmental Impact Statement on an interrelated basis between the five existing Metro plants and potential new sites.

THE HUMAN ENVIRONMENT

Many of the human environment facets pertinent to the Alki site are discussed and evaluated only in the Regional EIS. These include such categories as PSCOG goals and policies and transportation patterns. Such topics can only be analyzed on a regional basis by combining the four main sites plus auxiliary sites (e.g.,Cedar Hills sludge disposal site). This necessity to treat certain topics on a regional basis stems from the interrelatedness of the plants and the trade-offs between alternatives.

Existing Environmental Conditions

Site-specific impacts covered in this EIS are land use; legal and institutional; agency and neighborhood goals; social, recreational, and cultural; archeological and historical; health and safety; aesthetics and nuisance.

Land Use

This description primarily concerns the Alki community and service area and the Duwamish industrial and residential districts.

The Alki community is a predominantly stable and nearly completely developed residential area. Major recreational areas include Schmidt Park, Alki Beach Park and the Schmidt Viewpoint Park which serve local as well as other city residents. The community is beach oriented and will probably continue to attract residents to the area because of this association.

The City of Seattle has a Shorelines Management Program and regulates shoreline uses. Anyone wishing to build a structure exceeding $1,000 in cost or planning to alter existing conditions in the shorelines area must obtain a substantial development permit from the City of Seattle.

The Duwamish area contains some of the largest industries in Seattle, including petroleum, cement, electricity and aircraft industries.

Legal and Institutional

The legal and institutional elements considered include shoreline management regulations, PL 92-500, and U.S. Army Corps of Engineers permit regulations.

The City of Seattle/Shorelines Management Program has been previously described. These regulations would have a direct effect on activities within 200 feet of the existing shoreline. While not necessarily prohibiting expansion activities, the shorelines program would control certain aspects of such expansion.

Agency and Neighborhood Goals

Agency goals are described in depth in the Regional EIS. They include the following:

Puget Sound Council of Governments

The Puget Sound Council of Governments has proposed the Interim Regional Development Plan, which states:

> "Goal
>
> It is in the public interest to minimize the costs of future growth by encouraging new development within urbanized areas where necessary investments in public services have already been made."

In further expanding on this goal the following policies are included in the proposed document.

> "1. Existing public utilities, facilities and services shall be used to their fullest prior to expansion.
>
> 3. Encourage conservation efforts and the maximum utilization of utilities and services before increasing supply.
>
> 5. The pattern of development which produces the least cost in new public utilities, facilities and services shall be encouraged within feasible limits.
>
> 7. Plans for public services shall be consistent with regional growth policies and local comprehensive plans and shall be based upon: 1) criteria for population and employment distribution; 2) policies designed to limit demand, 3) responsible fiscal management."

Another goal of the PSCOG document related to natural environment and amenities is the following :

> "1. The natural beauty and liveability of this region shall be a primary consideration in the location, timing and quantity of growth.
>
>   a. Natural amenities identified as important to the region's character and beauty shall be preserved or sensitively developed as a second choice.

b. Patterns of development which minimize adverse impacts on these amenities shall be encouraged.

17. Permanent structures designed for human habitation, commerce, employment or public assembly should not be located within high risk zones, including 100 yr floodways, earthquake zones, or active landslide zones.

25. Achievement or maintenance of water quality standards as established by law is recognized and supported."

City of Seattle

As part of its general review authority, the City of Seattle would review the construction of a sewage treatment plant, rehabilitation of sewer lines or extension of sewage facilities through its building department. Two permits are required from the Seattle Building Department for the construction of facilities, including one which examines general design and construction and a second concerning filling and grading activities.

King County

In 1964 King County adopted a comprehensive plan. Certain provisions of this plan relate to the Metro Facility Plan and are included as follows:

"Utilities Development Policies

Trunk utility lines should be installed in advance or at the time of development in accordance with the general plan for the area. Local or service utility lines should be installed as needed.

Where pollution conditions now exist, all possible steps should be taken to correct such conditions."

Goals for Seattle, a report prepared by the Citizens of Seattle and adopted by the Mayor and the City Council includes the following statements:

"D. Goal: Water

The City should undertake all means reasonable and feasible to ensure water purity to meet health standards and protect the environment.

1. Undertake efforts to meet Federal Water Pollution Control Act requirements by 1984.

    a. It is the national goal that the discharge of pollutants into the navigable waters be eliminated by 1985.

    b. It is the national goal that wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water be achieved by July 1, 1983.

6. Ensure clean water to protect wildlife, vegetation and recreation areas."

Citizen opinion surveys were conducted by HRPI through Gerhardt Research in the Alki region.

When randomly chosen citizens were asked, in a Gerhardt survey, what environmental concerns needed most attention, most responded that they could think of none. Those who did have an environmental concern mentioned such things as park upkeep, heavy traffic on streets, noise or litter. Although a few mentioned water quality, none directly pointed out any of the wastewater treatment facilities as a serious environmental problem.

Of the 370 people interviewed, most knew of the treatment facility (about 84%), and it concerned a large number of people (31%). When asked if they would favor upgrading sewer treatment facilities as required by the law, the majority said yes (59%). Most who opposed were concerned about cost, necessity, unsightliness, the buying of private property, or location of the facility. The highest number (52%) felt that "cleaning up the environment" was more important than such local issues as the site fitting in with the environmental setting (15%) or the height of facility (11%). The consideration of upgrading or expanding the facility was controversial.

HPRI (Metro's socioeconomic consultant for the EIS) and Metro's community involvement staff conducted informal meetings which were attended by citizens of the West Seattle area explicitly concerned about the water treatment facility.

In general, this group felt more strongly than those randomly interviewed by Gerhardt Research that Alki is not well located. They felt that wastewater facilities should not be in prime beach land, but rather in industrial regions. Residents said that unpleasant odors often occurred.

The Alki Community Council, in November, 1976, developed the following guidelines, which "should not be construed as precluding the addition of other criteria and concerns as planning progresses."

"A. Closure of the present facility.

The present plant has never been considered an adequately engineered facility, or constructed for efficient operation when compared to more modern plants. If it is economically and technically feasible, the unanimous vote of the committee was to close down the plant. The property, including the Bar S playfields, should be reserved for use as a park and recreation area for the neighborhood and for Seattle residents. This property should be evaluated for potential usage as space for people a decade or more from now, when the need for parks and open space may be even more critical.

B. Expansion options for secondary treatment.

If the committee recommendation A is not feasible, then the following criteria are essential:

1. There must be restrictions on the size, height, and functions of any expanded or new facility. These restrictions must be used to minimize adverse effects upon the liveability of the surrounding neighborhoods.
2. There must be minimum sludge truck traffic in and out of the facility. Access routes must not impact the neighborhood, the traffic patterns, nor adversely affect the environment.
3. There must be no odor.
4. Architectural and landscaping features must be appropriate, approved by the community, and a performance bond posted to guarantee that the plans for these amenities will be fully implemented as planned.

5. There must be no further condemnation of residential property adjacent to or surrounding the present facility.

6. There must be a clear and accurate breakdown of the costs for the alternative options presented:

   (a) constructions costs per householder;
   (b) amount of increase in METRO use charges per householder.

   Cost breakdowns should also include the other 3 facility locations now being discussed (West Point, Carkeek Park, Richmond Beach).

7. The Alki plant is adjacent to Seattle park property. It is essential that expansion plans for the facility be evaluated for impact upon the beach and park property. As the population in the area increases and there is more intensive use of the Alki recreation facilities and beaches by all Seattle residents, there must be serious concern for preserving these areas.

8. The sources of funds for construction/expansion of plants at the 4 locations planned are of great concern to the committee. After the experience involved in the West Seattle Bridge controversy, where funding was the weakest link, the committee believes it would be irresponsible for any plans to be approved until an accurate estimate of costs can be provided to the public. The estimate must be accomplished by a firm commitment from federal, state, and/or other sources of funds for the necessary construction.

9. The committee is deeply concerned that every effort be made by METRO to evaluate technological advances which may be available, rendering present planning approaches either invalid or inadequate.

The Alki participants in workshop meetings were vocal, and concerned about their desires being acted upon. They wanted to convey that they are "good citizens" who have been "good sports" about having a plant in their neighborhood and that the agencies should carefully listen to them since they have had to live with the plant.

Currently in the Duwamish area, data is being collected on the sentiments of the people near the proposed plant sites at Diagonal Way and Harbor Avenue S.W.

Economics and Costs

A description of cost determinations is developed in the Regional EIS. In summary, costs, whether existing or proposed, include three components: capital cost, operating and maintenance costs, and total annual costs.

The capital costs include the initial expenditures for construction of wastewater treatment plants, sewage collection systems, effluent disposal methods, combined sewer overflow facilities, sludge handling and disposal techniques, plus the purchase of land and miscellaneous treatment-related equipment. These capital costs typically are major expenses that are made infrequently and that can be phased to suit planning requirements. Because capital or construction costs can require large sums of money at one time, they are often financed by bonds or other types of loans that are paid back with interest over a period of several years. The yearly payment on the original capital cost debt is referred to as the annual cost of capital or amortized cost.

Operation and maintenance costs include expenses such as wages for labor, purchase of chemicals and power, and replacement or repair of equipment. These costs occur continually or at frequent intervals during the life of the project.

The total annual cost of wastewater facilities is the sum of the annual payment on amortized capital and the annual operation and maintenance costs. The payment of total annual costs can be achieved by various means, including charges to persons who use the services.

Since user charges are determined regionally, they are discussed in the Regional EIS.

Employment

Employment considerations are developed in the Regional EIS.

Existing Environmental Conditions

Social, Recreational and Cultural

Principal recreation resources within the service area include Alki Beach Park, Schmitz Viewpoint Park, Loman Beach Park, Lincoln Park and Schmitz Park. Except for Schmitz Park all of these areas are in shoreline areas and support both active and passive water-oriented activities. A major factor in consideration of Alki expansion is the Bar S ballfield northeast of the existing Alki treatment plant. This ballfield is operated and maintained by the Seattle Department of Parks and Recreation.

Cultural patterns in the Alki area are somewhat independent of the Alki treatment facility and are considered only to provide comprehensiveness to the EIS.

In the Duwamish area, data is still being collected.

Archeological and Historical

The Alki Light Station and Alki Beach are historical sites near the Alki treatment plant; however, these sites would not be affected in any way by any of the alternatives. With regard to archeology, the Office of Public Archeology states:

> "Importantly, the Alki area owes its present topography from past cut-and-fill operations. Because of the intensive past disturbance of this site, we would anticipate no adverse archeological impacts associated with any proposed development." (Office of Public Archeology)

An archeological site has recently been discovered across the Duwamish River from the Diagonal Way site. The Diagonal Way site should also be investigated before construction.

No data are available on the Harbor Avenue site.

Health and Safety

Health and safety considerations include:

Occupational safety

- Public health and safety related to the various treatment facilities
- Existing health effects of combined sewer overflows
- Sludge handling
- Various construction areas such as the storage and transport of explosive or caustic chemicals

The Alki occupational safety record is generally in compliance with all applicable regulations.

The public health and water quality implications of sludge handling are described in the Sludge Management and groundwater portions of the Regional EIS.

There have occasionally been slight health risks from eating the shellfish collected along the shoreline close to the Alki outfall, which is described in the biological section of this EIS.

Aesthetics and Nuisance

The Alki treatment plant is generally well hidden from view from most residents in the Alki service area. However, some residents in the immediate vicinity, particularly those on surrounding bluffs, directly view the Alki plant. While the plant is not particularly displeasing and many of the plant components that would be most easily identified as part of a waste treatment plant are covered, the plant still has an industrial appearance.

In addition, odor problems have been reported by residents in the past. Metro has recently installed propane fired afterburners, which burn the excess gas coming off the anaerobic digesters. This gas, often called "sewer gas" contains methane, carbon dioxide, water vapor, and sulfides. Some of it is used to warm the anaerobic digestion units; some is used to run pumps, but excess is flared off. The heat at which the sewer gas burns is not high enough to oxidize the odorous compounds, but the temperature at which propane burns in these afterburners is high enough to oxidize many of the odorous compounds. These afterburners cost $160/day to run. Even with the afterburners installed, there still are complaints of odor problems from adjacent neighbors. The anaerobic digester at Alki has a floating cover; gases can leak out the sides. Also, primary clarifiers are in buildings but have openings to the outside air. This contributes to odor problems.

There are combined sewer overflows at Alki which cause odor and visual nuisances.

The outfall for the Alki treatment plant is shallow and short; it could allow odors, especially at low tide, and it is debated that it causes sewage buildup in the sediments of this area.

For the Duwamish area, data are currently being collected on aesthetics and nuisance. A wastewater facility may be more compatible in an industrial area like the Duwamish than in a residential area like Alki.

The roads which service the Alki treatment facility are not paved and are considered dusty by local residents.

CHAPTER III

ALTERNATIVES AND IMPACTS

In this chapter, the alternatives and their impacts are discussed in detail. The impacts of each alternative, both primary and secondary, on the physical, biological and human environments are discussed after a brief description of the alternative. Other issues related to each alternative such as mitigation measures and unavoidable adverse impacts are also discussed. A general statement of the Facility Plan objectives and the major issues involved, description of the methodologies in selection of alternatives and flow and waste reduction measures are also briefly discussed.

GENERAL

In order to assist in the selection of an environmentally sound and cost effective wastewater management alternative for Metro's service area and to encourage public involvement in the selection process, the alternatives developed in the Draft Facility Plan (Metropolitan Engineers, 1977) are described briefly in this chapter and evaluated in terms of environmental impacts and relation to the planning objectives of the study area. These objectives, as identified in the Facility Plan, include: (1) provision of capacity to serve the wastewater needs of the area through 2005; (2) protection and/or enhancement of receiving water quality; (3) adherence to the goals and/or legal requirements of PL 92-500; (4) control of combined sewer overflows; and (5) development of effluent and sludge re-use.

The environmental impacts of the alternatives discussed in this chapter cover all of the elements of the environment discussed in Chapter II. However, emphasis will be on the following issues as related to Alki:

(1) The effects of alternative treatment processes (primary, enhanced primary, and secondary) and combined sewer overflow controls on water quality, aquatic ecosystems

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and public health;

(2) Social, economic and public health effects of sludge handling and disposal methods;

(3) The aesthetic, social and legal compatibility of the alternatives with neighboring activities, land uses, community goals, comprehensive plans and special codes;

(4) The identification of any groups which might bear an undue portion of the costs in relation to the benefits they receive;

(5) Control of odors at or near the plant;

(6) Elimination of combined sewer overflow to Alki Beach;

(7) Preservation of adjacent playing fields.

In addition to the discussion of the primary and secondary impacts of the alternatives, other issues pertaining to each alternative such as unavoidable adverse impacts, measures that can be employed to mitigate the adverse impacts, and irreversible and irretrievable commitment of resources will be discussed for each alternative and compared to the other alternatives.

DEVELOPMENT OF ALTERNATIVES FOR ALKI

The major issues addressed in the discussion of the regional alternatives are pertinent in the selection of options available to the Alki plant. On the local level, access, noise, traffic, visibility, odors, and the availability of land for expansion to secondary treatment are all sensitive issues.

The role of the Alki plant in the Metro system has been addressed in the Draft Facility Plan, particularly as it relates to Alki site constraints and the regional issues.

Alternative A is a no action alternative for Alki. Alternative B, which represents no action pursuant to PL 92-500, would include improving the Alki outfall. Alternatives C and D address combined sewer overflows, but would affect Alki differently. In Alternative C, the Alki plant would be converted to enhanced primary, then abandoned, and in 1995 its functions replaced by a new Duwamish plant in wet weather and by transfer to West Point in dry weather. In Alternative D, the Alki plant would provide enhanced primary treatment from 1985 to at least the end of the planning period (2005). Alternatives E, G and H at Alki would upgrade treatment to secondary as required by PL 92-500, but necessitate expansion to the ballfield area. In Alternative F, Alki would be abandoned in 1985, with its functions replaced by a new plant in the Duwamish industrial area. A new outfall would be constructed at Alki Point to discharge Duwamish plus Renton flows.

The following section briefly describes considerations of the Alki service area, treatment process, combined sewer overflows, effluent disposal method, sludge management, flow and waste reduction measures and beneficial re-use of wastewater at Alki.

Service Area

The service area for Alki treatment plants would remain the same under all options due to the extent of development in the area and the existing drainage pattern of the collection system. The proposed Duwamish plants would also serve the Duwamish area and the southern portion of the West Point service areas, in order to reduce flows and take into account the site constraints at West Point or Alki.

Treatment Process

The alternative treatment processes for Alki are primary, enhanced primary and secondary treatment. Primary treatment, currently provided at Alki, is aimed at settling solids and organic materials that would consume oxygen in the water to which effluent would be discharged. Secondary treatment would improve solids and organics removal to approximately 85 percent and reduce metals, toxicants, bacteria and other contaminants in the discharge. Enhanced primary would be intermediate in effectiveness. Secondary treatment is required by PL 92-500. Alternatives which do not provide secondary treatment are not in compliance with the current federal laws and would not be eligible for state and federal funding unless these laws and regulations are amended.

To comply with the secondary treatment requirement, addition of a biological process in one form or another to the existing primary facility would be required. Processes considered were tower trickling filters, rotating biological contactors and air activated sludge. These processes vary in the amount of land required, energy and costs involved, and various aesthetic impacts. Based upon results of pilot plant studies and a comparison of environmental considerations, performance and reliability, air activated sludge has been recommended as the preferred process for upgrading to secondary treatment. Reference is made to the Facility Plan for further information.

Combined Sewer Overflows

Combined sewer overflows at Alki Beach currently discharge 5 million gallons per year at that site. Two alternatives (C and F) would virtually eliminate CSO's there.

Effluent Disposal

Since the current outfall at Alki does not have diffusers to adequately dilute the wastewater, the Draft Facility Plan calls for improving the outfall for each alternative where Alki remains. If a plant in the Duwamish were constructed, new disposal facilities would be necessary.

Sludge Management

The Alki plant currently digests the solids or sludge that settle in the primary treatment step. For alternatives that add enhanced primary or secondary treatment, the solids removed from the wastewater would increase, so expanded sludge treatment facilities would be required. Other alternatives include dewatering sludge to reduce its volume before hauling to the Cedar Hills landfill. This would require installation of dewatering equipment at Alki, but would reduce the frequency of sludge truck trips through the neighborhood.

Flow and Waste Reduction Measures

The measures considered for flow and waste reduction at Alki were domestic water conservation and pretreatment.

Domestic Water Conservation

As discussed in the regional report, Volume I, the reduction in wastewater flows through adoption of domestic water conservation and re-use measures is insignificant in a combined service system with a high rate of infiltration/inflow. This is clearly evidenced in the Alki collection system where infiltration during wet weather conditions could be as high as 5.8 mgd, which is almost double the base wastewater flow generated from the area. Estimates of storm flows entering the collection system could be up to 70 mgd which would be 20 times greater than the average dry weather sewage flow.

In addition, the implementation of domestic water conservation measures by Metro is not feasible under the current rate structure. To assure water conservation, local water districts would be more effective. Alternatively, a Metro rate structure which increased with higher flows to sewers could be a possibility.

Due to the storm water flows and Metro rate structure, water conservation was not considered in the Draft Facility Plan for developing alternatives at Alki. For more on this subject, the reader is referred to the Regional EIS.

Infiltration and Inflow

The characteristics of infiltration of groundwater into the collection system and inflow from storm and roof drains at Alki were examined to determine if flow could be reduced to the plant. In compliance with PL 92-500, a detailed infiltration analysis was conducted on the Alki collection system (Metropolitan Engineers, 1976). The analysis concluded that although infiltration is high, especially during wet weather conditions, it was not excessive and it would not be economical to remove it. Inflow into the collection system was also examined. Since the system is a combined sewer system, storm flows are appreciably high resulting in combined sewer overflow. Attempts to eliminate the inflow or appreciably reduce it by separation or some other means would not be cost-effective. Therefore, efforts are directed towards control of the combined sewer overflows. Various levels of control will be discussed later in this chapter for the various wastewater management alternatives considered. For more detail, the Facility Plan or Alki infiltration/inflow study should be consulted.

Pretreatment

Treatment to remove or reduce pollutants at their source before they enter the common sewerage system is known as pretreatment. It can reduce mass pollutant loadings on facilities and prevent the introduction of pollutants which might disrupt the treatment process and contaminate the discharged effluent or the waste residuals. Pretreatment efforts generally focus on industrial or commercial contributors of pollutants. Since the Alki treatment plant does not receive any industrial or commercial waste, pretreatment was not considered as a method in reducing flow or pollutant loading to the plant.

For alternatives that include the Duwamish site, which would include industries in the service area, pretreatment of industrial flows to reduce pollutant loads should be considered further.

Beneficial Re-use of Reclaimed Water

As discussed in the regional report, it is highly unlikely that any water reclamation would be justifiable in the Seattle metropolitan area, where abundant local sources of high quality water offer much greater potential at markedly lower cost. As it applies specifically to the Alki service area, the absence of industries and agricultural lands which might use reclaimed water further diminishes the potential for reclaimed water re-use. With the Duwamish sites, however, location near industries may improve the potential for wastewater reclamation and re-use.

REGIONAL ALTERNATIVES

The eight regional alternatives as described in the Draft Facility Plan are described briefly to illustrate how Alki and Duwamish facilities would fit into the Metro regional wastewater system. Specific alternatives for the Alki service area are described in the section following.

Eight alternatives on the regional level are being considered and evaluated by the 201 Facility Plan. These alternatives differ in the degree to which issues such as cost, water quality, and compliance with federal and local policies and goals are addressed. The regional alternatives consist of one "no-action" alternative, one alternative which continues unchanged the present comprehensive plan for the study area, two which emphasize combined sewer overflow abatement with minimal treatment upgrading, and four alternatives which achieve secondary treatment with variations on combined sewer overflow controls, site impacts, and re-use options. Alternatives E through H are the only alternatives that comply with the secondary treatment requirements of PL 92-500. The eight alternatives are described below and are shown in Figure 3-1.

Alternative A - No Action

No capital expenditure would be made for expansion, modification or upgrading of treatment plants and no construction of new interceptors during the planning period (until 2005). Alternative A is evaluated to meet SEPA "no action" requirements.

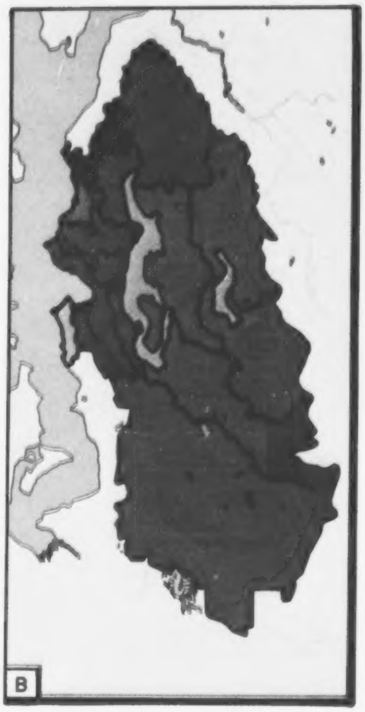
Alternative B - Metro Comprehensive Plan (No Action Pursuant to PL 92-500)

Plant upgrading and transfer interceptor construction would be done according to the Metro Comprehensive Plan. Alternative B is evaluated as the "no action" alternative pursuant to PL 92-500 and NEPA requirements and serves as the baseline for other alternatives. Puget Sound plants (West Point, Alki, Carkeek Park and Richmond Beach) would be retained with primary treatment. Improved sludge management and disinfection practices would be provided in Alternative B and all following alternatives. Four new transfer interceptors and improvements to the Alki outfall would be included.

Alternative C - Major Combined Sewer Overflow Control

Major portions of combined sewer overflows would be controlled by transfer from fresh to salt water and/or treatment. The existing Puget Sound plants would be upgraded to provide enhanced primary treatment by physical/chemical treatment of solids during the summer. A new wet weather enhanced primary treatment plant would be constructed in the lower Duwamish industrial area and the Alki plant would be abandoned, both in 1995.

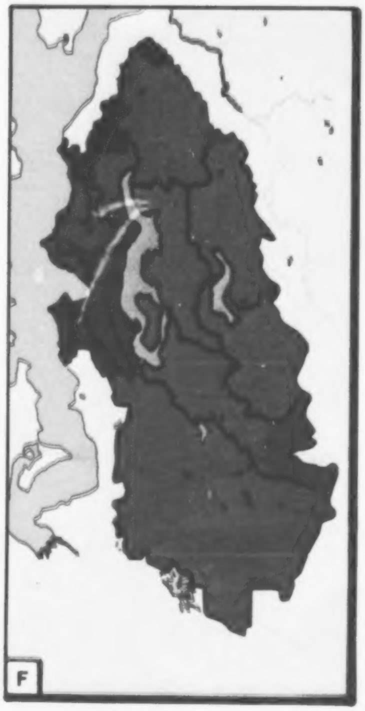
NO ACTION



COMPREHENSIVE PLAN
(NO ACTION PURSUANT
TO PL 92-500)

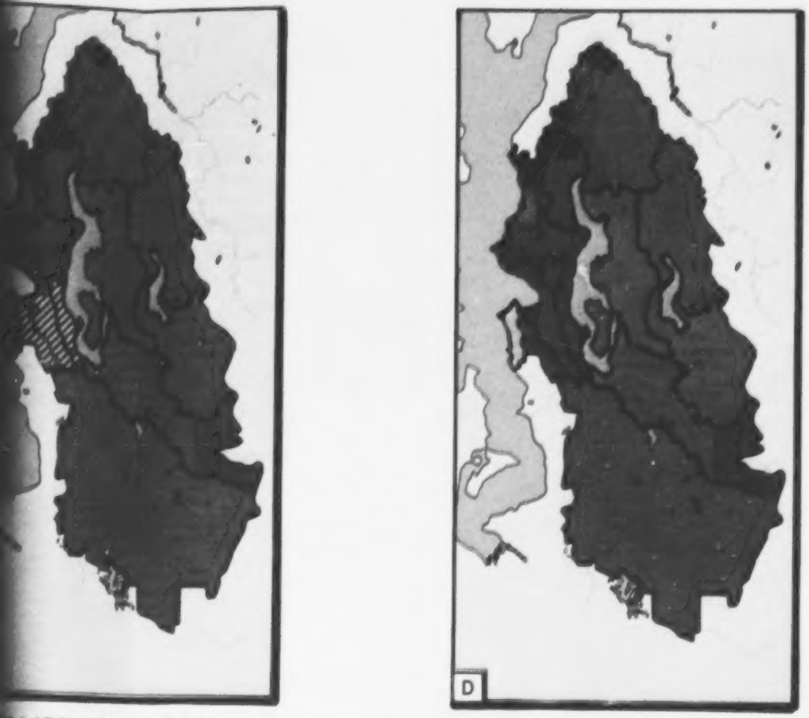
MAJOR CSO CONTROL

SECONDARY



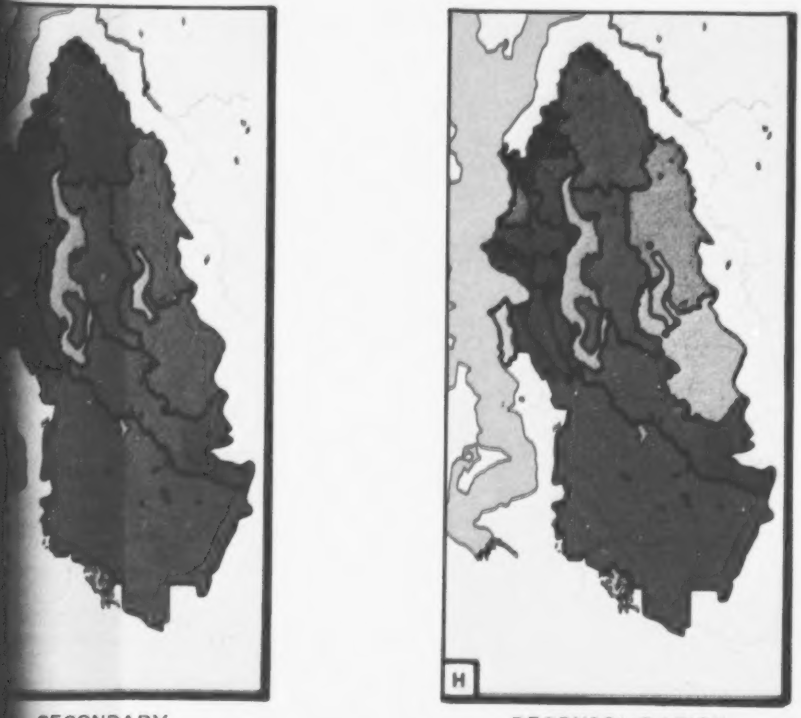
SECONDARY
SOUTHERN STRATEGY

SECONDARY
WEST POINT PHASE OUT
OPTION



AJOR CSO CONTROL

PARTIAL CSO CONTROL



SECONDARY
T POINT PHASE OUT
OPTION

DECONSOLIDATION
RECLAMATION

LEGEND

- ■ RENTON
- ■ WEST POINT
- ▨ DUWAMISH (STORMWATER)
- ■ DUWAMISH (WASTEWATER)
- ░ ALKI
- ■ RICHMOND BEACH
- ▒ CARKEEK PARK
- ■ NORTH LAKE WASHINGTON
- ▒ NORTH LAKE SAMMAMISH
- ░ SOUTH LAKE SAMMAMISH
- ▨ PRESENTLY SERVED BY OTHERS

- ● WASTEWATER TREATMENT PLANT
- ○ STORMWATER TREATMENT PLANT

Figure 3-1

Metro 201 Facility Plan
Service Area Alternatives

Alternatives and Impacts

Alternative D - Partial Combined Sewer Overflow Control

Wet weather combined sewer overflows would be reduced to Lake Washington, Lake Union and the West Seattle shoreline. The four Puget Sound plants would be upgraded to enhanced primary treatment with chemical addition during the summer for improved solids removal.

Alternative E - Secondary

Secondary treatment would be added to the West Point, Alki and Richmond Beach wastewater treatment plants by 1985. The Carkeek Park plant would provide primary treatment for wet weather flows only beginning in 1985; dry weather flows would be pumped to West Point.

Alternative F - Secondary/Southern Strategy

Secondary treatment would be provided at Richmond Beach and West Point (with a reduced service area). A major new secondary treatment facility would be constructed in the Duwamish industrial area in 1985; the Alki plant would be abandoned at that time. A new outfall off Alki Point would be built for discharging effluent from the Duwamish (and Renton) plants. The Carkeek Park plant would provide primary treatment for wet weather flow only beginning in 1985; dry weather flows would be pumped to West Point.

Alternative G - Secondary/West Point Phaseout Option

Secondary treatment would be provided at the Alki and Richmond Beach plants. West Point would continue as a primary treatment plant for wet weather flows only, beginning in 1985. A new secondary treatment plant in the Interbay area (Commodore Way or Golf Park sites) would be constructed. The Carkeek Park plant would provide primary treatment for wet weather flows only beginning in 1985; dry weather flows would be pumped to West Point.

Alternative H - Deconsolidation/Reclamation

Secondary treatment would be provided at West Point, Alki, Carkeek Park and Richmond Beach. Areas of growth would be served by new inland plants with local effluent and sludge re-use possible. Advanced waste treatment would be provided at new North and South Lake Sammamish plants. A new secondary plant at Kenmore would discharge treated effluent to Puget Sound.

Although there are eight regional alternatives, their component parts could be blended to develop a hybrid alternative, as described in Volume I, Regional EIS.

A summary of information pertaining to the Alki treatment plant alternatives is presented in Table 3-1. The plant site, capacity, treatment process, and sludge management system are outlined. More details are described in the following sections on each alternative.

TABLE 3-1

SUMMARY OF ALTERNATIVES FOR 2005

ALKI AND DUWAMISH

	A	B		C		D	G, H		F	
Site	Alki	Alki	Alki (Phase I)	Alki (Phase II)	Duwamish (Diagonal Way)	Alki	Alki	Alki (Phase I)	Alki (Phase II)	Duwamish (Harbor Ave. S.W.)
Treatment Process	Primary	Primary	Enhanced Primary (1983)	Abandoned (1995)	Enhanced Primary (1995)	Enhanced Primary (1985)	Secondary (1983)	Primary	Abandoned (1985)	Secondary (1985)
Capacity (average day/ peak)	10/30	10/30	10/30	0/0	0/250	10/30	10/30	10/30	0/0	45/145
Disposal Site	Existing Alki Outfall	Improved Alki Outfall (1986)	Extended Alki Outfall	Outfall Abandoned	Duwamish Estuary	Extended Alki Outfall	Alki Outfall	Alki Outfall	To Duwamish Plant	New Outfall at Alki for Duwamish plus Renton effluent
Sludge Management	Digested at Alki; trucked to landfill	Digested at Alki; trucked to landfill	Digested at Alki; trucked to landfill	None	Solids transferred to West Point for treatment	New sludge digester and dewatering equipment trucked to landfill	New sludge digester and dewatering equipment trucked to landfill	Digested at Alki; trucked to landfill	None	Digested at Alki; trucked to landfill
Transfer Facilities	None	None	None	Alki to Duwamish (West Point)	Alki to Duwamish (West Point)	None	None	None	Alki to Duwamish	Alki to Duwamish

ALTERNATIVE A (NO ACTION)

General Description

In the No Action Alternative, the existing conditions at Alki would be allowed to continue without any further expansion or upgrading. The alternative serves as a tool for planning additions and modifications to the existing facilities by establishing the adequacy of such facilities and the minimum requirements for their best performance.

The following sections describe the service area, collection system, wastewater treatment facility, and sludge management system under existing conditions, which would be the same as the No Action Alternative at Alki.

Service Area

The Alki wastewater treatment plant serves a residential area of 4100 acres in the southwest corner of the City of Seattle. The service area is bounded by Puget Sound on the West, Elliott Bay on the north, approximately 35th Avenue S.W. on the east, and by a line extending southwesterly from 36th S.W. and Foxbury to Puget Sound on the south (Figure 3-2). The service area is primarily residential with a 1975 sewered population of 44,000. There are no major industries in the area with any significant wastewater discharge. There are no major freshwater bodies within the Alki service area.

Under certain alternatives, the service area for Duwamish would be considered. Because this area is presently part of the West Point service area, its characteristics are described in the West Point EIS document.

Collection System

The Alki system was originally constructed as a combined sewer system. Since then the system has been partially separated by connection of street drains to a new storm system. However, roof drains and other inflow sources are still connected to the old combined system.

The first city sewers were constructed in 1913, but most were installed in the 1920's. Additional sewers were installed as the area developed. Construction of the inter-

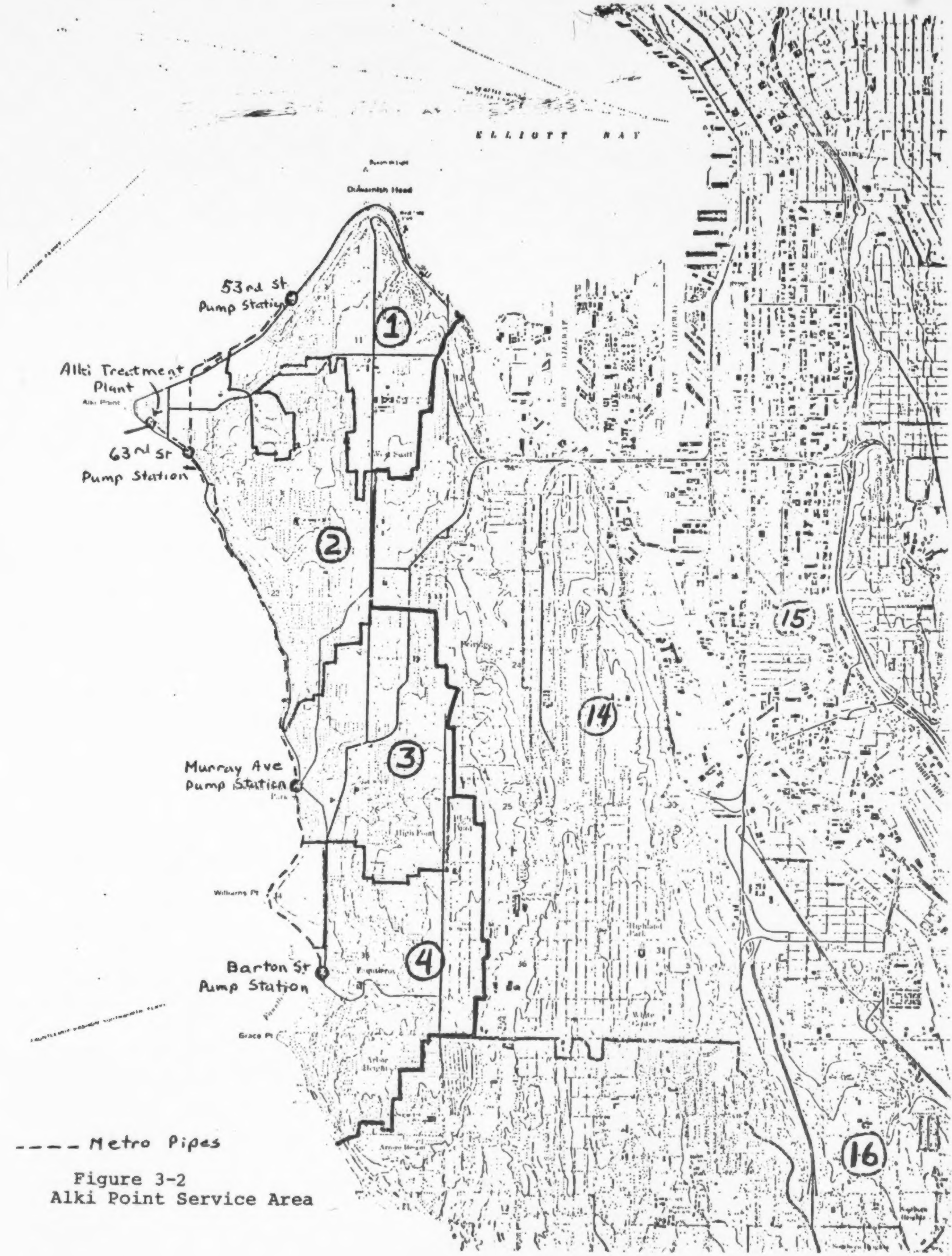

ELLIOTT BAY
Duwamish Head
53rd St Pump Station
1
Alki Treatment Plant
Alki Point
63rd St Pump Station
West Seattle
2
3
Murray Ave Pump Station
High Point
Williams Pt
4
Barton St Pump Station
Grace Pt
Arbor Heights
14
15
Highland Park
White Center
16
---- Metro Pipes

Figure 3-2
Alki Point Service Area

ceptor sewers and force mains began in 1951 and was completed in 1958. These interceptor sewers intercepted flows from eleven combined sewer outfalls that had been discharging raw sewage into Puget Sound, and conveyed the flows to the treatment plant near Alki Point. Metro assumed control of the interceptor system and treatment plant from the city in 1962.

The Metro interceptor system consists of a series of force mains, pressure sewers and gravity sewers which run along the waterfront (Figure 3-2).

The sewers in the Alki service area are maintained by the City of Seattle Sewer Utility Division. (In the past 10 years, 45% of the sewer system has been systematically inspected. It is expected that the remaining portion will be inspected in the coming 10-15 years.)

Adequacy of Alki collection system. Due to the age of the collection system at Alki (much of it is about 50 years old), cracked pipes and loose joints are expected; this allows groundwater to infiltrate into the system. Combined sewer overflows occur at all four Metro pumping stations in the Alki service area. The wet weather flows tributary to the pumping stations are far higher than their respective capacities, most notably at the 63rd Street pumping station at Alki Beach. The City of Seattle combined sewer system also overflows to Puget Sound and Elliott Bay.

Wastewater Characteristics and Treatment Facility

The following sections describe briefly the wastewater quantity and quality in the Alki area and the existing treatment facility and its adequacy under the present conditions.

Wastewater flows. Flow data collected for a three-year period, 1973-1975, indicates that the monthly flow at the Alki plant fluctuated between 4.1 and 13.1 million gallons per day (mgd). Average flow during that period was 7.5 mgd. The yearly average has increased by more than 8 percent since 1973. The sewered population would grow by filling in of partially occupied areas. The increased population could be handled by the plant's design capacity of 10 mgd. The peak wet weather flow through Alki is restricted to its maximum hydraulic capacity of 30 mgd.

Due to the combined sanitary and storm water collection system, winter flows vary directly with rainfall; the wet weather monthly average is over 2.5 times greater than the dry weather flow. Since the flow to the plant is not by gravity but rather is pumped from the 63rd Street pumping station, the peak hourly flow is determined by the maximum capacity of the pumping station. The station has a maximum capacity of 50 mgd. Because of the hydraulic design of the Alki treatment plant, maximum flow has been limited to 30 mgd. All flow in excess of this figure bypasses to Puget Sound at the 63rd Street pumping station.

Wastewater characteristics. In the Alki service area, land use is primarily residential with some commercial activity. In addition, a major portion of the collection system is a combined system and rather old. These conditions produce a moderately concentrated sewage during the summer months and weak-to-moderate sewage during wet weather conditions.

Physical and chemical indices that are commonly used to define wastewater characteristics, treatment requirements and performance and to assess the impact of the treated effluent on receiving waters are BOD, COD, suspended solids, nutrients and heavy metals.

Annual average five-day biochemical oxygen demand (BOD), a measure of the oxygen demanding organic materials of influent wastewater to the plant during the three-year period (1973-1975), is 98 mg/l. This gives a monthly flow-weighted BOD loading of 5,800 pounds per day. The highest recorded monthly concentration was 147 mg/l in June 1975; a BOD loading of 7,200 pounds per day. BOD concentrations vary inversely with flow, so BOD loadings to the plant are variable throughout the year.

The mean suspended solids concentration of the influent stream over the three-year period is 120 mg/l. A peak monthly value of 179 mg/l was recorded in June 1975. Monthly flow-weighted suspended solids loadings were 7,200 pounds per day. Daily flow-weighted loadings should give a slightly lower average loading. The suspended solids concentrations vary inversely with flow because of effects of dilution; however, it does not show characteristic seasonal variations. Based on BOD and suspended solids characteristics of wastewater influent to the plant, the flow is classified as weak to medium strength sewage.

Detailed information is not available on the concentration of metals in Alki influent. However, recent analysis of effluent composite samples revealed the following concentrations in mg/l:

Cd	Cr	Cu	Hg	Ni	Pb	Zn
0.004	0.01	0.04	0.0002	0.060	0.03	0.09

Data on nitrogen and phosphorus concentrations in the Alki influent and effluent are not available.

Alki treatment plant. The Alki treatment plant is located on a 2.8 acre site in the West Seattle area near the Alki Point lighthouse. An aerial view of the site is shown in Figure 1-2. The plant site is adjacent to a playground and beach on Puget Sound and is surrounded by a residential area. The site of the playground, although zoned for high density residential development, is designated for recreational or park use by the City of Seattle Comprehensive Plan. Metro holds a purchase option on the site for possible use in plant expansion.

Sewage is pumped to the headworks of the plant from the 63rd Street pumping station. A high level overflow at the headworks feeds into an automatic bypass line which connects to the plant's outfall if flows exceed 30 mgd. Prechlorination, important in odor control, is provided at a manhole in the headworks structure where a chlorine solution is supplied to the influent flow via an open-ended pipe. Only manual chlorination is available. After passing the headworks, the wastewater travels through two flow measuring devices and then enters the grit removal tanks where the grit is removed and hauled away.

Raw settled sludge and floating materials are captured in the primary sedimentation tanks and pumped to the primary digester by means of a manually controlled sludge pump. The effluent from the primary tanks enters a collection channel which connects directly to a chlorine contact channel.

Chlorine is supplied by two 2,000 pounds per day gas chlorinators. All chlorination equipment, including two chlorine injectors, is located in the chlorinator room. Each chlorinator can function either as a prechlorinator or a postchlorinator. Injector water is obtained from the plant spray water system which uses plant effluent. Chlorine solution is conveyed by rubber-lined pipe to the point of application at the inlet end of the chlorine contact channel. Operation of the chlorinators is manually controlled; grab samples from the chlorine contact channel are tested for chlorine residuals and the results used as guidance for manual control.

Effluent leaves the chlorine contact channel and discharges to Puget Sound through a 42-inch diameter reinforced concrete submarine outfall which terminates 1,300 feet offshore, at a depth of 79 feet, in an open-ended pipe.

Adequacy and reliability of the Alki treatment plant. The Alki Point treatment plant was originally constructed in 1958 and has had several modifications. Currently, operational problems are experienced with the barminutors at the headworks. Also, the pre-aeration units are limited in size and cannot adequately treat the total flow pumped to the plant. The pumping flow to the plant is erratic, and this affects performance adversely. Measures to dampen such fluctuations in flow would be required to achieve a consistently high quality effluent, particularly with secondary treatment in Alternatives E, G and H.

Adequate disinfection of the effluent cannot be attained under the present operating conditions. Chlorine feeding is adjusted manually on a daily basis, rather than proportional to the flow, resulting in varying dosage rate. A low dosage rate would result in poor disinfection of the effluent, while a high dosage rate would result in excessively high chlorine residual. The chlorine contact time is partly accomplished in the submarine outfall, and the detention time is inadequate to accomplish the desired levels of disinfection at high flows. The coliform count in the effluent cannot be monitored.

The operation of the outfall is considered to be inefficient as a result of poor initial dilution and shallow discharge depth. Effluent plumes directly over the discharge point are noticeable, and diluted effluent apparently reaches the shore regularly. If the Alki plant continues to operate, improvements to the outfall will be necessary. These would include extending the outfall into deeper water and adding a diffuser section.

The plant is provided with means for complete bypass of the plant during emergency conditions. The plant is partially bypassed when flows in excess of the plant peak capacity occur during the rainy season. Control of combined sewer overflows will reduce or eliminate such overflows, depending on the level of control.

Odor control measures include prechlorination, postchlorination and burning waste digester gas in afterburners. However, complaints from the neighborhood about odors are still reported.

Since the plant provides primary treatment only, the unit operations involved are rather simple to control and operate and therefore can be considered reliable. Adequate surveillance is also provided. The plant is manned seven days a week, 14 hours a day during weekdays and 8 hours during weekends. When unmanned, critical processes at the plant are monitored at the main control center at West Point. Standby power is available and comes on automatically in case of a power failure, thus maintaining continuous operation of the plant.

Sludge Characteristics and Management

The Alki sewage treatment plant has its own sludge digestion facilities, but no sludge dewatering equipment. Currently, digested sludge is hauled directly, in an undewatered form, to the Cedar Hills County landfill holding basins, thus bypassing the West Point treatment plant entirely.

Impacts

Only primary impacts are considered in the site documents (Alki, Carkeek Park, Richmond Beach and West Point, Draft EIS, Volume II). For information concerning secondary impacts (Renton) please see the Regional Draft EIS, Volume I.

Geology, Soils and Topography

Because no site modifications are included, the No Action Alternative would have no impact on slopes and soil stability, erosion and deposition, topography and soil profile, or shorelines.

Earthquake hazards to existing structures would continue. Risks are moderate at this site based on soil type, but limited in areal extent and of short duration. Structures on fill, soft or loosely consolidated soils, are at greater risk of long wave shaking; bedrock and well consolidated deposits of short wave shaking.

The PSIS sampling near West Point found changes in the organic content, grain size and chemistry of marine sediments in the characteristic plume positions for this treatment facility. As current conditions and physiographic features of Alki are like those at West Point, similar effects are assumed to occur including the probability of effluent coming ashore during part of the tidal cycle.

Information on sediments off the Alki outfall is sparse. Sedimentation rate is moderate and surface sediments show a high (2.2) enrichment of lead in surface sediments of unidentified origin.

Air Quality and Odors

All of the strategies including No Action involve the handling of chlorine and raw sewage. The alternatives also require the operation of the sewage collection system in which hydrogen sulfide, methane, and other products of anaerobic decomposition commonly collect. All of them involve the use of diesel and gasoline engines, both in pumping and treatment plant operations and for routine transportation and commuting. In high enough concentrations, chlorine, sulfur dioxide, hydrogen sulfide, and methane can be dangerous to human health. Chlorine and methane are also explosive. The dangers from these gases are well known.

The existing treatment plant site is generally well ventilated so that air emissions do not tend to concentrate, though there is the possibility of entrapment against the bluff. Odors, however, have been a recurring problem at Alki. Complaints are received regularly. Since there are no changes in the treatment plants under Alternative A, the potential for odor problems at Alki would continue as at present, causing moderately unpleasant conditions over a limited area.

Water Quality

The No Action Alternative would retain the Alki Point outfall as it exists now, even though that outfall is considered to be inefficient as a result of poor initial dilution and shallow discharge depth. No action would also maintain the hydraulic capacity of the Alki plant at a level insufficient to treat all influent wastewater during wet weather, so that CSO's would increase.

A decline in effluent quality would result as loadings increase from growth in sewered areas. The volume and frequency of CSO's would increase, continuing and increasing water quality degradation. Public health concerns could become increasingly important due to rising coliform bacterial counts and viruses in nearshore waters and shellfish. Inadequate dilution and disinfection are considered to have some responsibility for nutrients, potentially toxic chlorine residuals and coliform counts at Alki beaches. CSO's contribute bacteria and nutrients as well, but are in addition sources of heavy metals, pesticides, PCB's, and other chemicals.

Biology

Terrestrial habitats. The No Action alternative is expected to have no impact on terrestrial habitats, such as urban, nonurban, forest and meadow lowland, as no construction is involved.

The intertidal. All beaches in the Alki service area are accessible to the public. The PSIS dye studies have indicated that at West Point, intertidal and nearshore organisms are occasionally exposed to effluent at a dilution about half that at the diffuser or 250:1. The frequency and distribution of these events have not been determined. Changes in the intertidal flora at West Point possibly attributable to effluent nutrients have been described (Thom et al., 1977). Based on current patterns in central Puget Sound, as delineated by the physical model, similar effects very likely occur regularly at Alki due to effluent coming up on eastside beaches during part of the tidal cycle.

Combined sewer overflows to Alki service area intertidal occur at 7 points. West Seattle beaches receive a total of about 5.5 million gallons annually. Limited sampling of biota at the Denny Way overflow (Metro Staff, 1976) indicated a highly disturbed situation reflected in low diversity and abundance of organisms. The Denny overflow itself met water quality criteria for receiving waters (EPA, 1975) for all parameters except mercury. Copper and zinc were generally two or three times higher in biota at Denny Way as in sediments. Mercury was not measured at Denny Way and metals levels in biota at other overflow points were not examined. In the absence of data, the Alki overflows are assumed to be similar.

As overflows generally contain metals and toxicants which do not degrade and are bioconcentrated, the overflows to West Seattle beaches may possibly have minor to moderate adverse long-term effects limited to certain intertidal areas and generally irreversible.

Levels of trace metals in intertidal biota at outfall and background areas were examined as part of the PSIS (Schell et al., 1977). Mercury in mussels and lead in all organisms examined (a brown alga, a green alga, mussels and clams) were higher at all outfall areas than at background areas (Point No Point, Blake Island). Other trace heavy metals which were higher at Metro outfall areas than at background areas were cobalt in clams, zinc in clams and mussels, copper in clams, chromium, selenium and cerium in mussels. The U.S. Food and Drug Administration mercury standards for shellfish (0.5 ppm) and the Canadian Food and Drug Directorate lead level of 2 ppm net weight were not exceeded in any sample. Standards for other metals have not been set.

Eelgrass beds which occur at Alki could be subject to effluents brought up on the beach by tidal currents. West Seattle beaches are also subject to combined sewer overflows, as mentioned previously. While eelgrass beds are highly productive and have a unique assemblage of plants and animals, including the larvae of a number of fishes and crustaceans, they tend to be in organic-rich sediments which may be anaerobic just below the surface. Therefore, nutrients, BOD and suspended solids from any source would probably affect them but little. "Irreversible" contaminants such as metals, toxicants or pesticides could however be incorporated into organisms which become food for juvenile commercial herring, flatfish, young salmon or waterfowl. The effect is presently unknown but judged to be adverse, probably minor, limited in extent to certain areas and long-term. Increased overflows in the future could increase the magnitude of the effect.

Intertidal hardshell clams occur at Alki and West Seattle beaches and at Lincoln Park. Geoducks occur subtidally from Alki Point to Point Pully. State standards for fecal coliforms in shellfish waters were exceeded at all sites sampled in the study area. Whether the coliforms are due to treatment plant effluents, to sewer overflows or to septic tank seepage has not been determined. Shellfish are not monitored for coliforms in the study area at present. Thirteen species of "significant" marine birds are recorded from Alki and from Point Pully including loons, grebes, black brants, scoters, sandpipers, and sanderlings (Salo,1975).

Puget Sound. The intertidal, nearshore subtidal, and offshore bottom, free-swimming and planktonic organisms off the Alki service area are subject to effects of combined sewer overflows, treatment plant effluent, runoff, septic tank seepage, boat wastes and other pollutant sources. The intertidal zone has been discussed previously.

Phytoplankton productivity is subject to effects of naturally varying chemical and physical parameters. As a result, it is almost impossible to detect the effects of treatment plant effluent nutrients on the variation in algal population size, and growth rates in time and space. Effects on zooplankton are unknown.

Metals in plankton near outfall areas have been compared to background areas (Point No Point) (Schell et al., 1977) and to a sludge disposal site off Fourmile Rock in Elliott Bay. Filter feeding zooplankton take in particles of the size on which metals adsorb best. Zinc and copper were significantly higher in plankton at outfall areas than at the control station.

The distribution of some nearshore and offshore benthic organisms (foraminifera, worms, clams, snails) appears to be correlated with typical plume positions for West Point and Carkeek Park effluents, for which data are available, especially along the 150 foot contour. Studies on Alki have not been performed but a similar effect of minor magnitude is assumed to occur for the purposes of the impact analysis.

Nearshore free-swimming (nektonic) forms include juvenile salmon, herring, and other commercial fishes that frequent the outfall pipe, kelp, or eelgrass areas in the daytime or at night. These animals could be occasionally exposed to levels of chlorine and perhaps to other constituents at higher than "safe" levels in effluent. Localized effects of effluents in nearshore areas could affect herring populations directly or through their zooplankton prey and thus affect salmon and other organisms which feed heavily on herring in open waters (Miller et al., 1976). While no data are available, it is possible that offshore nektonic organisms may also be occasionally affected by chlorine, pathogens or toxicants if they swim into or through effluent, or if they feed in nearshore areas at night. Criteria for intermittent exposure of aquatic organisms to total residual chlorine (TRC) are time related. For marine organisms, a concentration of 0.02 mg/l for 100 minutes is a recommended criterion (Brungs, 1976; Mattice & Zittel, 1977). Toxicity of Alki effluent has not been examined. Chlorine residuals at the West Point diffuser with a 190:1 dilution are at the borderline for chronic effects on marine life with continuous exposure. The Alki outfall has only a 10:1 dilution, so it appears that chlorine residuals tne times higher than near West Point could exceed criteria for chronic effects and will approach acute effects in waters in the vicinity of the Alki plume at slack water. The potential effect on marine organisms is considered to be adverse, minor-to-moderate, limited in extent in the waters, of short duration (slacktide), and reversible.

Among the factors contributing to the present concern for potential and environmental impact of chlorination is the formation of halogenated organic compounds, specifically haloforms, in chlorinated effluents. The principal concern is that the incorporation of a halogen (chlorine, bromine, iodine, fluorine) into an organic molecule increases its attraction to fats in animal tissue which usually results in increased toxicity and bioaccumulation. There is a growing sentiment that alternate forms of disinfection to chlorination be emphasized to protect aquatic life. Recent studies (Marine Research, 1976; R. K. Kawaratani, personal communication) have shown that haloforms occur in approximately the same concentrations after disinfection of power station cooling water (saltwaters) with any of chlorine, bromine, ozone, or hydrogen peroxide.

Commercial and sport fisheries. There are a number of important sport and commercial fisheries within and adjacent to the Alki service area. Those which occur in areas that could potentially be impacted by treatment plant effluent and/or sewer overflows are salmon (sport fishing in Elliott Bay; commercial fishing south of Alki), herring (commercial fishery from north Alki to Harbor Island), shrimp (fished in Elliott Bay to Harbor Island), and crab (north and south of Alki Point and at Lincoln Park).

The Duwamish estuary. The biota of the Duwamish (which includes anadromous fishes discussed above)could be affected by facilities plans at Alki that include a Duwamish secondary plant discharging with Renton flows through the Alki outfall ending Renton discharge to the Duwamish (Alternative F). The biota of the estuary is discussed in the regional document which is Volume I of this series.

Rare or endangered species and critical habitats. No listed endangered species are recorded from the study area. Critical habitats, which include salmon spawning and rearing areas, fish migration routes and commercial fish areas and waterfowl resting areas, have been discussed in previous sections.

Natural Resources and Energy

Natural resources and energy impacts are not analyzed on a site-specific basis. Rather, these considerations are analyzed in the Regional Environmental Impact Statement on an interrelated basis between the five existing Metro plants and potential new sites.

The Human Environment

Many of the human environment facets pertinent to the Alki site are discussed and evaluated only in the Regional EIS. This includes such categories as PSCOG goals and policies and transportation patterns. Such topics can only be analyzed on a regional basis by combining the four main sites plus auxiliary sites (such as Cedar Hills sludge disposal site). This necessity to treat certain topics on a regional basis stems from the interrelatedness of the plants and the trade-offs between alternatives.

Land use. No new land would be used under Alternative A. Current land use in a prime real estate area would continue. This is considered adverse, minor, long-term, local, reversible and definite.

Legal and institutional. Many of the legal issues are developed in the Regional EIS. This alternative does not fulfill the requirements of PL 92-500.

Agency and neighborhood goals. This alternative does not fulfill the goals of the King County Comprehensive Plan that "where pollution conditions now exist, all possible steps should be taken to correct such conditions."

This alternative does not fulfill the goals of the Alki Community Council that: "If it is economically and technically feasible, the unanimous vote of the committee is to close down the Alki plant. The property, including the Bar S playfields, should be reserved for use as park and recreation area for the neighborhood and for Seattle residents."

Employment and costs. Employment and cost considerations are developed in the Regional EIS.

Social, recreational and cultural. Under this alternative, the Bar S baseball diamonds would not be affected, which is considered favorable, minor, long-term, reversible, local and definite. However, degradation of the water near the Alki outfall would continue with only primary treatment; discouraging the recreational use of area beaches.

Archeological and historical. No known archeological or registered historical sites would be affected by this alternative, because no construction is proposed.

Health and safety. There may continue to be health risks associated with the consumption of raw shellfish due to the discharge of effluent, as discussed in the biological section of the EIS.

An unlikely safety hazard is accidental leakage of chemicals when they are in transport or handled on site. Although nearly every U.S. water and wastewater treatment facility uses chemicals, there have been very few chemical-related accidents.

The health and safety problems related to sludge transport and disposal would be as probable as for any other trucks in transit.

Aesthetics and nuisance. The Alki treatment facility would continue to be a nuisance to local residents: it would have an industrial appearance and could still be responsible for odors. This impact would be adverse, major, long-term, local, reversible and definite.

Under this alternative, 1.7 sludge trucks per day would leave the Alki facility. These would cause some nuisance on residential streets and some congestion along an already crowded beach front, but the impact is considered minor.

Mitigation Measures

Because of the no action definition of Alternative A, no mitigation measures can be proposed.

Unavoidable Adverse Impacts

All adverse impacts under Alternative A would be unavoidable. These would include impacts on water quality from CSO discharge, related impacts on public health and fish, continued use of plant sites in parks or residential areas, and violation of PL 92-500.

ALTERNATIVE B METRO COMPREHENSIVE PLAN NO ACTION PURSUANT TO PL 92-500

General Description

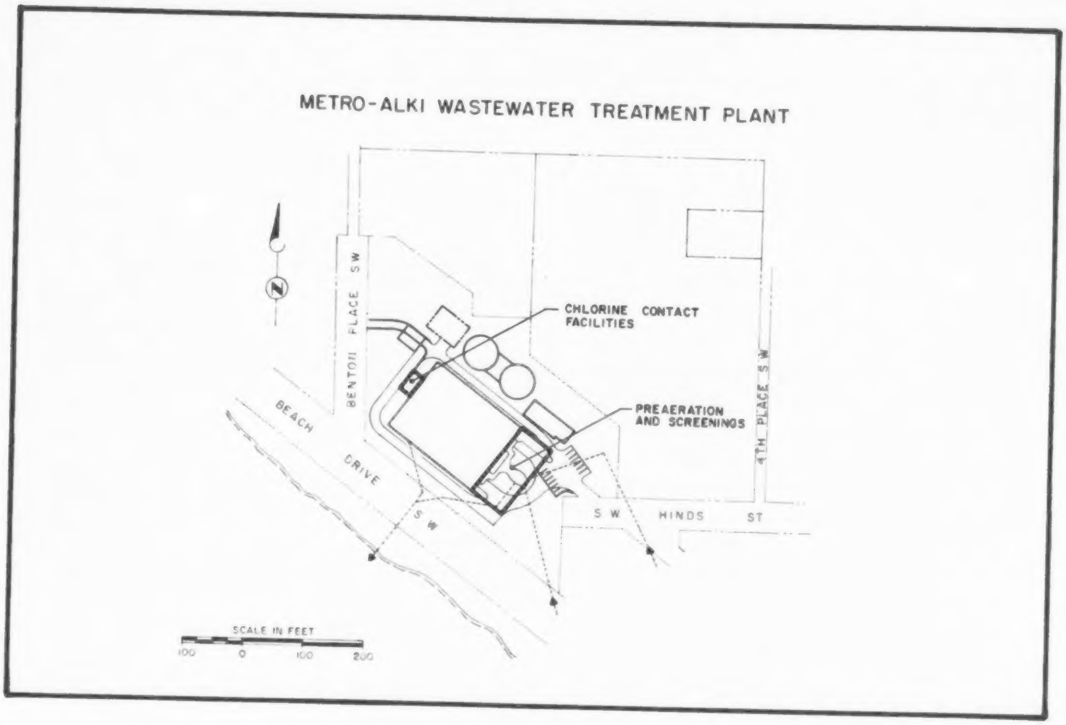
In this alternative, the policies and programs of the Regional Comprehensive Plan conceived prior to the enactment of PL 92-500 would be implemented. Metro's primary treatment facilities would be expanded and upgraded primarily to accomodate growth resulting from Metro's present sewer expansion policies.

The Alki service area, under this alternative, would cover the same area tributary to the existing treatment plant (Figure 3-1). Additional interceptors or pumping stations would not be required. The increase in the sewered population tributary to the system would result from filling in of partially occupied sewered areas. Additional sewering would be limited mainly to service laterals. The treatment plant and the tributary pumping stations will continue to receive more wet weather flow than can be handled, and accordingly there will be more combined sewer overflows. The additional population could be served by the plant's present design capacity of 10 mgd average and peak capacity of 30 mgd. Flows in excess of the peak flow will be discharged to Puget Sound untreated.

Under this alternative, primary treatment at Alki would continue. Enlargement of the plant would not be required since the projected flows for the planning period are within the design capacity of the plant. Consequently, additional site area will not be required. Improvements, however, would be provided and would include additional chlorination facilities and expansion of the pre-aeration and screening facilities. The outfall would also be extended and diffusers added to provide adequate mixing and prevent the effluent from reaching the shore. The improvement cost is estimated at $13 million. A layout of the plant site is shown in Figure 3- 3 , which illustrates the location of improved chlorination, pre-aeration and screening equipment.

Under this alternative provisions for additional sludge handling facilities are not included. Sludge will be hauled directly to Cedar Hills landfill for disposal.

Combined sewer overflows of 5 million gallons per year at Alki Beach would continue as under existing conditions.


METRO-ALKI WASTEWATER TREATMENT PLANT
N
BENTON PLACE SW
CHLORINE CONTACT FACILITIES
PREAERATION AND SCREENINGS
4TH PLACE SW
BEACH DRIVE SW
SW HINDS ST
SCALE IN FEET
100 0 100 200

PRIMARY – – UPGRADED

Figure 3-3

Alki Layout – – Alternative B

Impacts

Primary impacts only are discussed in this document; secondary impacts are evaluated in the regional analysis.

Geology, Soils and Topography

Impacts would be as in Alternative A, except that Alternative B (and C through H) assumes improvements to the Alki outfall, in the form of extension of the outfall into deeper water and addition of a diffuser section. Construction would have a major but limited and probably short-term adverse impact on benthic sediments and on light transmittance in overlying waters. It is assumed that ultimately the outfall could mean an improvement in nearshore and intertidal sediments potentially affected formerly in a minor way by effluent moving onshore as a result of tidal currents as at West Point. Information on existing Alki sediments is sparse. It is assumed that extending the outfall would improve nearshore sediments and initiate some changes in sediments further offshore near the new discharge point. The negative effects are potentially minor, as the effluent plume would be small, and limited in extent on the sediment of Puget Sound.

Earthquake damage to the outfall line could result from shock waves or from submarine landslides (if the strata are arranged appropriately, which has not been determined). A break in the line could allow effluent to boil up through the opening. As this effect would have approximately the same magnitude and probability of occurrence for all alternatives, it has not been evaluated here.

Air Quality and Odors

All of the strategies including Alternative B involve the handling of chlorine and raw sewage. The alternatives also require the operation of the sewage collection system in which hydrogen sulfide, methane and other products of anaerobic decomposition commonly collect. All of them involve the use of diesel and gasoline engines, both in pumping and treatment plant operations and for routine transportation and commuting. In high enough concentrations, chlorine, sulfur dioxide, hydrogen sulfide and methane can be dangerous to human health. Chlorine and methane are also explosive.

The existing treatment plant site is generally well ventilated so that air emissions do not tend to concentrate, though there is the possibility of entrapment against the bluff. Odors have been a continuing problem at Alki. Complaints are received regularly. Under Alternative B, the odor problem would continue to cause moderately unpleasant conditions over a limited area.

Water Quality

Primary effluent would continue to be discharged at Alki, but through an extended and improved outfall. CSO's to Elliott Bay would continue. Some minor improvements would be made to the Alki chlorination facility.

Temperature, dissolved oxygen and salinity would be unaffected. Nutrients would be reduced somewhat at the beaches and nearshore by extension of the Alki outfall. Some nutrients would continue at beaches due to CSO inputs. The net adverse effect would be minor, because the contribution of nutrients is not large; limited to Alki beaches; long-term, because the discharges would continue through the planning period; and reversible. The adverse impact from suspended solids contribution is not large; limited to Alki beaches; long-term because CSO's are intermittent but recurring; and reversible.

Suspended solids inputs from CSO's would continue and increase, continuing to have minor, limited, short-term negative impacts. Coliform counts and chlorine toxicity potential should be reduced by the new outfall, both nearshore and at the beaches. Minor negative impacts from chlorine could continue offshore. Coliforms would continue to be moderate or high for short periods due to CSO's, both on the beaches and nearshore.

Heavy metals, pesticides, and PCB inputs would be expected to continue at present levels in the absence of CSO control.

Biology

Terrestrial habitats. Alternative B involves no site expansions.

The intertidal. Elements of Alternative B which would impact the intertidal are the extension and improvement of the Alki outfall, increased flows and loads by 2005 of 22% at Alki over 1976 levels, and continued sewer overflows approximately at present rates. While impacts of nutrients, pathogens and toxicants have not been examined in the biota of Alki beaches, it is assumed that they occur based on current patterns and the low dilution at the outfall.

Improvements to the Alki outfall would be expected to reduce the nutrients, pathogens, solids and other parameters that may affect intertidal biota. Increased algal biomass at Alki could be due to nutrients being carried shoreward from the outfall during part of the tidal cycle (R. Matsuda, personal communication, 1977). Also, the rocky substrate is conducive to attached algae growths. The increase is difficult to quantify, however, as some species are harvested for food. The effects on the kinds and numbers of clams are equally difficult to assess for the same reason.

Surface tidal current patterns in central Puget Sound indicate eddy systems forming north and south of Alki Point and West Point. Dye studies at West Point indicate that intertidal and nearshore organisms are occasionally exposed to effluent at a dilution concentration about half that at the diffuser, or 250:1. While no such studies were done at Alki, based on the current patterns, the authors consider it highly likely that effluent enters the intertidal zone at this site as well, but with unknown frequency.

At Alki sewer overflows would continue at present levels to 2005, Alki facility flows would increase 22%, and the Alki outfall would be improved. The overflows contribute annually the equivalent 0.1 to 0.2% of the flow from the Alki facility (about half a day's flow), 0.5 - 0.6% of the solids and 0.1% of the BOD. With respect to the intertidal, the improvement of the outfall appears to be potentially more important than the continued level of sewer overflows, although the overflows contain essentially untreated wastes including metals and toxicants. Metals are generally higher in intertidal biota near outfall areas.

While coliform bacteria have not been measured in intertidal shellfish, the overlying waters fail to meet state bacterial standards. As edible shellfish are dug near Alki, the potential effects on public health of metals and pathogens are a consideration. Eelgrass beds near Alki, which are important feeding and breeding areas for commercial fishes and their prey, could also be subject to effluent.

Nutrients, BOD and solids would probably slightly affect these areas; any toxicants or pesticides could accumulate affecting the fishes, their prey, and their predators. In the absence of data on metals, toxicants and the frequency of exposure to pollutants, the magnitude of the impact is unknown.

Puget Sound. The intertidal, nearshore subtidal, and offshore bottom, free-swimming and planktonic organisms in the study area would continue to be subject to effects of combined sewer overflows at present levels, increased flows and loads from treatment plant effluents, plus runoff, septic tank seepage, boat wastes, and other pollutant sources. The intertidal zone has been discussed previously. The difference in effects between Alternatives A and B are due primarily to the improvement in the Alki outfall and increases in effluent flows over 1975 levels. Improving the Alki outfall is not expected to affect phytoplankton production at these flow volumes. No effect on zooplankton has been determined, perhaps due to sampling problems. In the absence of any data, the present effect is judged to be unknown and future effects unpredictable. Metals would probably remain higher in zooplankton near outfall areas than at background areas, however (Schell et al., 1977).

The effects on the benthos identified in PSIS studies have been correlated with the West Point plume position. Alki areas were not sampled. The benthic conditions at this site are unknown, but are probably similar, based on water circulation. The potential adverse effect would continue, probably at moderate levels, and limited on the bottom. The area affected by the Alki plume would be transferred further offshore and the area presently affected would probably return to a former condition.

Nearshore free-swimming (nektonic) forms include juvenile salmon, herring, and other commercial fish that frequent the outfall pipe, kelp, or eelgrass areas in daytime or at night. These animals could continue to be occasionally exposed to levels of chlorine at higher than safe levels and perhaps to other constituents in effluent.

Localized effects of increased effluents in nearshore areas could affect herring populations directly or through their zooplankton prey and thus affect salmon and other organisms which feed heavily on herring in open waters (Miller et al., 1976).

While no data are available, it is possible that offshore nektonic organisms may also be occasionally affected by chlorine, pathogens or toxicants if they swim into or through effluent or if they feed in nearshore areas at night.

Criteria for intermittent exposure of aquatic organisms to total residual chlorine (TRC) are time related. For marine organisms, a concentration of 0.02 mg/l for 100 minutes is a recommended criterion (Brungs, 1976; Mattice & Zittel, 1977). Alki effluent is chlorinated to a residual of 0.5 mg/l and diluted 10:1 at the outfall to 0.05 mg/l. This suggests that organisms near the outfall could be exposed to higher than safe levels of chlorine. The potential effect on these organisms is considered to be adverse, minor, limited in extent to areas near the outfall, of short duration and reversible, even with increased effluent flows and no improvement in chlorination facilities. With extension of the outfall and addition of a diffuser, the effect could be greatly reduced or eliminated.

Commercial and sport fisheries. There are a number of important sport and commercial fisheries within and adjacent to the Metro area. Those which occur in areas which could potentially be impacted by treatment plant effluent and/or sewer overflows are salmon (runs up the Duwamish; sport fishing at Harbor Island, and in Elliott Bay; commercial fishing south of Alki), herring, (commercial fishery from north Alki to Harbor Island), steelhead (runs up the Duwamish), and shrimp (fished in Elliott Bay to Harbor Island). The lower Duwamish is crucial for the migration of juvenile salmonids. The potential for stress or contamination of these species is high. The magnitude of the actual effect is unknown, but could be substantial.

The Duwamish estuary. The biota of the Duwamish (which includes anadromous fishes discussed above) would continue to be affected by CSO's at about present levels and Renton treatment secondary effluent, at about 250% of present levels as well as industrial inputs, runoff, etc. The ecology of the estuary is discussed in the regional document which is Volume I of this series.

Rare or endangered species and sensitive habitats. No listed endangered species are recorded from the study area. Critical habitats, which include salmon rearing areas, fish migration routes, and waterfowl resting areas have been discussed in previous sections.

Natural Resources and Energy

Natural resources and energy impacts are not analyzed on a site-specific basis. Rather, these considerations are analyzed in the Regional Environmental Impact Statement on an interrelated basis between the five existing Metro plants and potential new sites.

The Human Environment

Many of the human environment facets pertinent to the Alki site are discussed and evaluated only in the Regional EIS. This necessity to treat certain topics on a regional basis stems from the interrelatedness of the plants and the trade-offs between alternatives.

Land use. No new land would be used under Alternative B. Current land use in a prime real estate area would continue. This is considered adverse, minor, long-term, local, reversible, and definite.

Legal and institutional. Legal issues are developed in the Regional EIS. This alternative does not fulfill the requirements of PL 92-500.

Agency and neighborhood goals. This alternative does not fulfill the goals of the King County Comprehensive Plan that "where pollution conditions now exist, all possible steps should be taken to correct such conditions."

This alternative does not fulfill the goals of the Alki community council that: "If it is economically and technically feasible, the unanimous vote of the committee is to close down the Alki plant. The property, including the Bar S playfields, should be reserved for use as park and recreation area for the neighborhood and for Seattle residents."

Employment and costs. Employment and cost considerations are developed in the Regional EIS.

Social, recreational and cultural. Under this alternative, the Bar S baseball diamonds would not be affected, which is considered favorable, minor, long-term, reversible, local, and definite. Degradation of the water near the Alki outfall would continue with only primary treatment. However, since the outfall would be extended, the effect on water quality would probably not be as great as it is now so recreational usage of the Alki area beaches would not be discouraged.

Archeological and historical. No known archeological or registered historical sites would be affected by this alternative.

Health and safety. There may continue to be health risks associated with the consumption of shellfish due to the discharge of effluent, as discussed in the biological section of the EIS.

An unlikely safety hazard is accidental leakage of chemicals when they are in transport or handled on site. Although nearly every U.S. water and wastewater treatment facility uses chemicals, there have been very few chemical-related accidents.

The health and safety problems related to sludge transport and disposal would be as probable as for any other trucks in transit.

With safety conscious procedures there should be a slim chance of accidents during construction of the outfall.

Aesthetics and nuisance. The Alki treatment facility would continue to be a nuisance to local residents: it would still have an industrial appearance and could still be responsible for odors. This impact would be adverse, major, long-term, local, reversible, and definite.

Under this alternative, 1.7 sludge trucks per day would leave the Alki facility. These would cause some nuisance on residential streets and some congestion along an already crowded beach front, but the impact is considered minor.

Mitigation Measures

While some odor-controlling measures have been implemented, odor remains a problem at Alki. Odor-control is an important and feasible mitigation measure for all alternatives. The costs of odor control are being calculated by Metro and will be available by the end of July, 1977.

Visual impacts of the facilities, which are highly visible by service area residents from above, could be mitigated by landscaping.

The energy and traffic impacts of additional sludge truck trips could be mitigated by the installation of dewatering facilities to reduce sludge volume.

An improved chlorine feed system can be designed to prevent chlorine levels in the sewage treatment plant effluent from exceeding toxic levels. This could be achieved by matching chlorine levels to effluent discharge and/or intalling a chlorine contact tank, which would maximize the effectiveness of chlorination treatment. Currently, chlorine is injected into the effluent flow at a constant rate calculated daily. This causes a fluctuating chlorine residual.

Unavoidable Adverse Impacts

Under this alternative, the following adverse impacts would be unavoidable.

Construction. Although construction activities can be screened from public view, they will still be a temporary nuisance.

Sludge trucking. Under current practices of disposing sludge at remote sanitary landfill sites, there will necessarily be sludge trucking.

Combined sewer overflows. This alternative does not take adequate measure to control CSO's; they will still occur in wet weather.

Primary effluent effect on water quality and biota. This alternative does not implement secondary treatment; the minor water quality degradation of Puget Sound would continue as would effects on biota.

Noncompliance with PL 92-500. Public Law 92-500 requires the installation of secondary treatment. This alternative does not comply.

Land use. Land is required in all alternatives; the question is: where will the impact occur?

Aesthetic nuisance of plant location. Wastewater treatment facilities are a nuisance in all alternatives; the question is: how can these nuisances be made smallest?

Operation and maintenance and capital costs. Construction of wastewater facilities, interceptors, and CSO holding tanks is expensive. The facilities must be operated and maintained.

Energy expenditures. Energy can in part be provided by the methane produced in anaerobic digestion, but there is still a large expenditure of energy which cannot be mitigated.

ALTERNATIVE C
MAJOR COMBINED SEWER OVERFLOW CONTROL

General Description

Alternative C is designed to control combined sewer overflows on the regional level. Overflows to Lake Washington, Green Lake, Lake Union/Ship Canal, Alki Beach and the lower Duwamish would decrease. However, CSO's to Elliott Bay would increase.

For the Alki area, this alternative would involve abandoning the Alki plant in 1995 and transferring its flow to the new wet weather plant to be constructed in the Duwamish industrial area.

The first phase Alki service area under this alternative would be similar to the existing one. Collection system modifications, however, would be required. The modification would include enlargement of the existing 63rd Street pumping station to pump a total flow of 70 mgd, a force main, and a gravity system, possibly at the tunnel, to transport the flow to both the Elliott Bay interceptor and the Duwamish wet weather plant. Combined sewer overflows would be reduced appreciably under this alternative. Five holding tanks would be provided in the Alki/Duwamish area to store the flows in excess of the collection system's and pumping stations' design capacity. The following is a list of proposed collection system improvements:

53rd Ave., SW pump station enlargement

53rd Ave., SW holding tank

SW Barton Street pump station revisions

SW Barton Street holding tank

Murray Avenue, SW pump station revisions

Murray Avenue, SW holding tank

Miscellaneous revisions - SW Dawson Street, etc.

63rd Avenue, SW pump station interim revisions

Combined sewer overflows would decrease to 0.15 million gallons per year at Alki Beach.

Alternatives and Impacts
Alternative C

The Duwamish wet weather plant is expected to be located on Diagonal Way Avenue, but the site is not firm. It would serve approximately 23,000 acres consisting of Alki and southern portions of Elliott Bay and southwest Lake Washington service areas. The majority of the sewers within these areas are combined sewers; storm water in the Alki system is mainly limited to roof drains.

The plant, by virtue of being a storm plant, would operate on an intermittent basis and would be subject to rapid increases and fluctuations in flow. A possible layout of the plant is shown in Figure 3-4. The plant would provide enhanced primary treatment for removing solids, metals, and other related contaminants from those flows generated by the Alki and southern West Point service areas. Disinfection would be provided prior to discharge to the Duwamish through a new outfall just south of the Harbor Island.
Solids settled from storm water would be stored on-site then transferred to West Point via the interceptor system for treatment.

Under this alternative, the Alki treatment plant would be demolished and the site abandoned by 1995, as shown in Figure 3-5. Dry weather flows from the Alki service area would be treated at West Point, while the wet weather flows would be treated at the new Duwamish wet weather plant at the Diagonal Way site. Effluent would no longer be discharged to Puget Sound and the outfall would be abandoned.

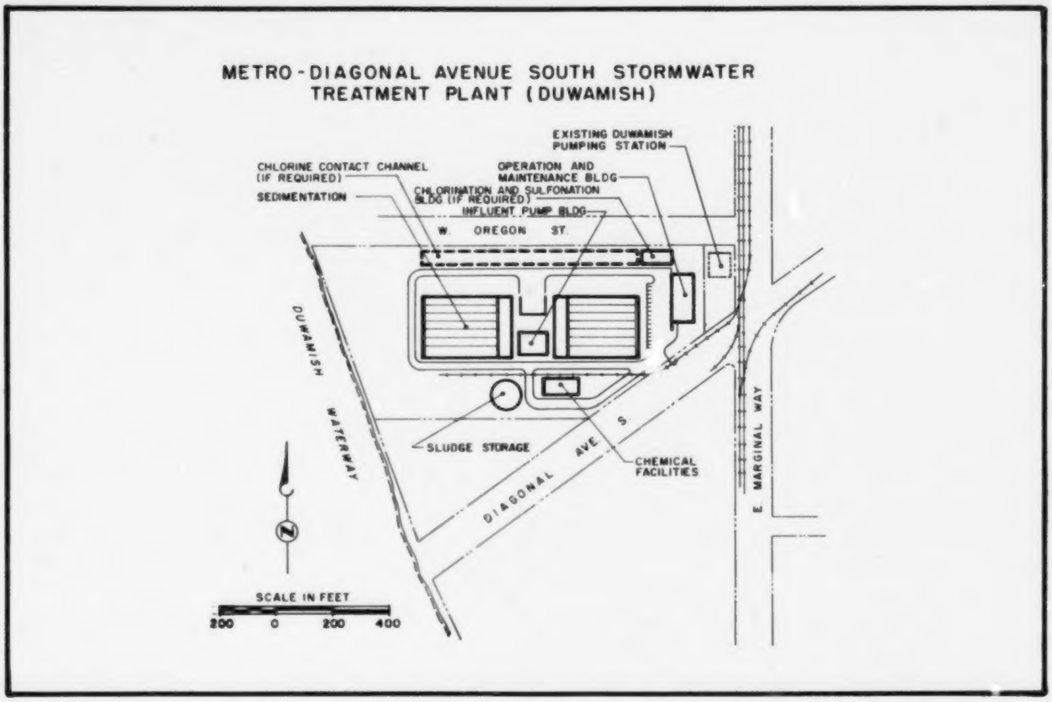
In the period from 1983 to 1995, the Alki plant would be upgraded to enhanced primary treatment (as shown under Alternative D) for improved solids removal. The capacity would increase to 10 mgd average, 30 mgd peak due to a larger sewered population. The outfall would be extended and improved for better effluent dilution. Sludge would be digested and dewatered by centrifuge at the site (see Figure 3-6), then trucked to Cedar Hills landfill.

Impacts

Primary impacts only are discussed here; secondary impacts are evaluated in the regional analysis.

Geology, Soils and Topography

Alternative C involves excavation for foundation construction at the Duwamish site with eventual abandonment


METRO-DIAGONAL AVENUE SOUTH STORMWATER TREATMENT PLANT (DUWAMISH)
EXISTING DUWAMISH PUMPING STATION
CHLORINE CONTACT CHANNEL (IF REQUIRED)
OPERATION AND MAINTENANCE BLDG
SEDIMENTATION
CHLORINATION AND SULFONATION BLDG (IF REQUIRED)
INFLUENT PUMP BLDG
W. OREGON ST.
DUWAMISH WATERWAY
SLUDGE STORAGE
DIAGONAL AVE S.
CHEMICAL FACILITIES
E. MARGINAL WAY
N
SCALE IN FEET
200 0 200 400

WET WEATHER PLANT – – PRIMARY

Figure 3-4
Duwamish Layout – – Alternative C

ABANDON

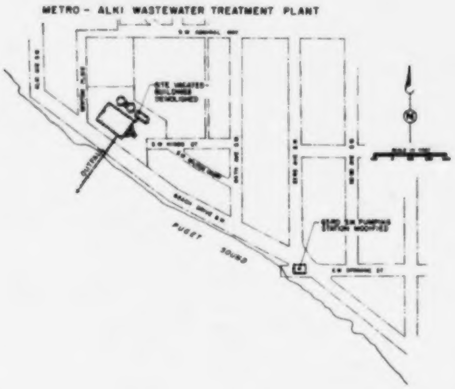

METRO - ALKI WASTEWATER TREATMENT PLANT
SITE VACATED-
BUILDINGS
DEMOLISHED
OUTFALL
BEACH DRIVE S.W.
PUGET SOUND
N

Figure 3-5
Alki Layout — — Alternative C

of the Alki plant. The Duwamish sites are in areas of deep alluvial or fill deposits and any structures erected there would require piling and dewatering for foundation support. Necessary pre-construction studies of local soil conditions and the special precautions necessary to ensure stable foundations would add to the duration and cost of construction. Such soils also carry the highest earthquake hazard risks. The precautions necessary to deal with the above hazards are well known. However, the impact of construction waste debris on its disposal site could be adverse, and of long duration, but minor and limited in extent.

Alternative C requires a tunnel under West Seattle and the Duwamish River to transport sewage from the Alki site to the new Duwamish wet weather treatment plant. Stability is not expected to be a major problem in these glacial deposits. However, there is some risk of reducing the stability of the bluffs, particularly near the portals. Disposal of muck from the tunnel excavation may pose a major environmental problem depending on where this material is taken.

Alternative C also includes construction of the Alki connections to West Point expected to be completed in 1995. Construction impacts in the form of increased erosion potential and subsequent deposition would probably be moderate, but limited in extent to the area of the pipe and for the duration of construction. Additional soil and foundation characteristics information would be developed before construction.

At Alki, the treatment plant would be eventually dismantled (1995) and the site graded to the level of the existing adjacent ballfield. This process would generate dust, erosion potential, and construction waste (debris) disposal concerns. Primary impacts are expected to be minor, limited in extent, and of short duration at the facility site.

Alternative C requires construction at Alki where bedrock is close to the surface. Construction at Alki may require heavy equipment or blasting to excavate for the foundations. The strength of the bedrock is not well known, but would be established through detailed site investigations prior to commencement of construction. The excavation of bedrock would affect topography, however, in a minor way. Construction waste disposal could pose minor problems of limited extent but long duration. Earthquake hazard would continue at baseline levels. More sludge would be generated in enhanced primary treatment from 1983 to 1995, but the disposal site at Cedar Hills is expected to suffice on an interim basis. Sludge disposal impacts are evaluated in the regional analysis.

Information on Alki sediments is sparse. It is assumed that improving the outfall (before abandonment in 1995) would improve nearshore sediments and initiate some temporary changes (until 1995) in sediments further offshore near the new discharge point. The negative effects are potentially minor, as the effluent plume would be small and limited in extent on Puget Sound sediment.

Overall, the impacts of C with respect to slope and stability of foundations and earthquake damage potential are major and adverse. Erosion and deposition problems are considered to be minor, limited in extent, and of short duration (less than five years). The effect on marine sediments of the improved outfall (used until 1995) and the effects at the sludge disposal site would be as in Alternative B.

Air Quality and Odors

Generally, the impacts on air quality under Alternative C would be as for Alternative B except for the addition of construction effects. The latter would occur 1) as dust at Alki and Duwamish sites, increasing local particulates levels, 2) as emissions from the engines of heavy machinery. The emissions to Duwamish area would be concentrated more as air circulation is poor in the valley, which is subject to inversions. The contribution of the construction and operation of the Duwamish plant, however, would be a tiny fraction of the existing atmospheric pollutant load of the area.

Odors would be reduced at Alki due to the abandonment of the plant, control of CSO's in the area and the extension of the outfall. The potential for odors would increase in the Duwamish on the site of the new facility. In general, the odor problems now associated with Alki would be exacerbated by transferral to the Duwamish Valley which is subject to poor air circulation, frequent temperature inversions, and already high pollutant loads. The potential for odors associated with the proposed holding tanks is discussed in the Regional EIS.

Water Quality

Alternative C calls for abandonment of the Alki plant in 1995, with construction of a new wet weather facility in the Duwamish discharging primary effluent to the Duwamish through a new outfall. Duwamish effluent would be chlorinated. CSO control at Alki would be essentially complete (97%), improving beach and nearshore water quality conditions. The health risk associated with consumption of shellfish from Alki would very probably be reduced. CSO control will reduce the inputs of heavy metals and pesticides to Alki waters, reducing the hazards of long-term bioaccumulation of toxicants in fishes and other organisms. Heavy metals would continue in the intertidal from direct runoff and aerial fallout, however.

The Duwamish plant's construction could require extensive dewatering, a problem judged to be minor and short-term. The effect of discharge of chlorinated primary effluent to the Duwamish is unknown at present.

The construction of the Alki outfall improvements would entail excavation of bottom sediments, with resulting disruption of those sediments and increased turbidity in the overlying waters. The effects are judged to be adverse and moderate, but highly limited in extent, short-term and reversible.

The interim improvements to the plant and outfall would generally improve water quality. Extending the outfall could prevent effluent from coming ashore (as is assumed, based on currents similar to West Point where the phenomenon is documented), which could reduce inputs of pathogens, solids, metals, and toxicants to the intertidal. Chlorine residuals concentration would be reduced through better initial dilution achieved at the diffuser structure.

Groundwater levels would not be affected. Duwamish water quality would be secondarily affected by the expansion of the Renton treatment plant, as discussed in the Regional EIS which is Volume I of this series.

Biology

Under Alternative C, Alki would be abandoned and a wet weather plant constructed in the Duwamish by 1996. Discharge of up to 250 mgd of wet weather primary effluent to the Duwamish would stress resident biota, although the discharge would be diluted. At the same time CSO to Elliott Bay would increase 25 percent. Major CSO control would relieve pressure on biota at Alki. Pathogens in shellfish at Alki would be substantially reduced, probably due to CSO reduction and extension of the Alki outfall. Flows and loads to Puget Sound would increase at all plants except Alki which would be abandoned.

Terrestrial habitats. The effects on terrestrial habitats are expected to be negligible, as new facilities would be in urban areas. Site impacts for the Duwamish plant are expected to be negligible, as the sites occur in a highly industrialized area of Seattle where terrestrial habitat is minimal. Abandoning the Alki plant would be followed by landscaping, thus increasing the terrestrial habitat available in the form of ornamental trees and lawns. The impact would be positive, major, very limited in area, but long-term.

The intertidal. Elements of Alternative C affecting the intertidal area are a reduction in CSO's at Alki, increased CSO's to Elliott Bay, increased effluent discharges from the Alki outfall until 1995, when it is abandoned, upgrading of Alki effluent to enhanced primary treatment levels, and improvement of the Alki outfall until abandonment in 1995.

CSO's to Alki/West Seattle beaches would be almost eliminated (97% reduction), very probably reducing the amount of metals, solids, BOD, nutrients, oil, grease, pathogens, and toxicants impinging on biota and available for uptake and concentration. Limited data available (at Denny Way) on effects of a larger overflow of CSO to saltwaters indicate adverse effects are moderate-to-severe, limited in extent, of long duration and probably irreversible for metals and toxicants. The potential benefit of reduction of CSO's would be moderate, also limited and long-term. Metals and toxicants levels would stabilize in biota. Intertidal communities could gain in abundance and diversity at sewer overflow points.

The Elliott Bay intertidal is considered to be far less sensitive as much of it is highly disturbed urban waterfront. While CSO's would become less important under Alternative C, enhanced primary effluent flows would continue at Alki until 1995 when the plant is abandoned. The Alki outfall would similarly be improved then abandoned in 1995.

In the interim, Alki would be upgraded to enhanced primary treatment, allowing for some reduction in BOD, solids, metals, and phosphates loads. The levels of nitrates would be as at present however, and it is these nutrients that can become limiting in the Sound. Assuming effluent enters the intertidal occasionally, the potential enrichment effect of effluent would continue at Alki but effects would be reduced or eliminated with improvement and eventual abandonment of the outfall.

As chlorination facilities would be as presently operated, overchlorination and underchlorination would be common. Underchlorination would probably maintain fecal coliform levels in excess of state shellfish standards, and overchlorination could produce chlorine residues toxic to intertidal and eelgrass bed organisms. When Alki is abandoned, these effects would be eliminated. With respect to solids, oil, grease and toxicants, Alternative C would result in a moderate benefit to the intertidal. With respect to potential chlorine, toxicants, nutrients, metals and pathogens, there would be little change in or even an increase over present levels of impact except, eventually, at Alki.

Puget Sound. Effects on Elliott Bay and West Seattle nearshore and offshore waters from Alternative C would be from effluent plus the extension and abandonment of the Alki outfall, and continuation of chlorination practices. Nutrient loads would continue, with a similar increase in potential over-enrichment problems.

The distribution of some nearshore and offshore benthic organisms appears to be correlated with characteristic plume positions for West Point and Carkeek effluent. Similar effects probably occur at Alki, but have not been examined. Those effects connected to nutrient enhancement are assumed to remain and those connected with solids or other loads could decrease in magnitude until 1995 when the outfall is abandoned.

Offshore and nearshore free-swimming organisms may continue to be occasionally affected if they swim into or through an effluent patch, or if they feed in nearshore areas at night. The effect is considered to be minor, limited in extent to the plume area and of short duration as overchlorination is short-term, but continuing.

The composition, diversity and abundance of fishes off the Alki outfall could change as overall loads (except nutrients) to the Sound through the outfall would decrease with enhanced primary treatment.

With the abandonment of the Alki outfall in 1995 the effects of this point source would be eliminated probably with benefits to the benthic nearshore and offshore environments. The pipe itself would continue to be attractive to fish who feed on attached animals. Any metals or toxicants in these organisms would probably remain.

Commercial and sport fisheries. Reducing sewer overflows to the Duwamish and Elliott Bay would improve the quality of these waters important as migration, spawning and rearing areas to migrating salmonids and as sport fishing areas. Reducing CSO's to Alki/West Seattle would benefit the herring fishery associated with those areas.

At the same time, the new outfall to Elliott Bay (discussed previously) would threaten fish transition, migration, and feeding areas.

The Duwamish estuary. Sewer overflows would be reduced under Alternative C by about one-fourth. The effects of the CSO control alone are considered to be a minor long-term benefit to limited areas of the estuary ecological community compared to the effects of the Renton facility, which would greatly increase (see Regional EIS Volume I). The effect of a new primary effluent discharge on the biota of the lower Duwamish is unknown at this time, but discussed further in the Regional EIS.

Rare and endangered species. No impact is expected as no listed endangered species are recorded from the study area. Sensitive habitats, which include salmon rearing areas, fish migration routes, waterfowl resting areas, etc., have been discussed in previous sections.

Natural Resources and Energy

Natural resources and energy impacts are not analyzed on a site-specific basis. Rather, these considerations are analyzed in the Regional Environmental Impact Statement on an interrelated basis between the five existing Metro plants and potential new sites.

The Human Environment

Many of the human environment facets pertinent to the Alki site are discussed and evaluated only in the Regional EIS. This necessity to treat certain topics on a regional basis stems from the interrelatedness of the plants and the trade-offs between alternatives.

Land use. At Alki, the facility would temporarily be expanded to include enhanced primary, which would not require the acquisition of new land; by 1995, the Alki facility would be abandoned, to be replaced by a wet weather enhanced primary treatment facility at the Diagonal Way site on the Duwamish.

The eventual abandonment of the Alki site would be favored in the Alki area. Data are being collected on the response of Duwamish area residents to a wastewater facility in their community.

Legal and institutional. Legal issues are developed in the Regional EIS. This alternative does not fulfill the requirements of PL 92-500.

Agency and neighborhood goals. This alternative fulfills the goals of the Alki community council, that: "If it is economically and technically feasible, the unanimous vote of the committee is to close down the Alki plant. The property, including the Bar S playfields, should be reserved for use as a park and recreation area for the neighborhood and for Seattle residents."

This alternative also attempts to fulfill the priorities set by the PSCOG that "natural amenities identified as important to the region's character and beauty shall be preserved or sensitively developed as a second choice" by abandoning the Alki facility, which is on prime beach land, but does not fulfill the same agency's goal that "existing public utilities, facilities, and services shall be used to their fullest prior to expansion," when the still-operable Alki facility is abandoned.

Employment and costs. Employment and cost considerations are developed in the Regional EIS.

Social, recreational and cultural. Under this alternative, the Bar S baseball diamonds would not be affected, which is considered favorable, minor, long-term, reversible, local, and definite. Further, the land which is currently used for the wastewater treatment facility could eventually be used for other recreational purposes.

Degradation of the water near the Alki outfall would continue with only primary treatment; however, the outfall would be extended into the Sound. Further, in this alternative, combined sewer overflows are controlled, improving water quality. The net effect would be an improvement in the water used for recreation. This impact is considered favorable, minor, long-term, irreversible, local, and probable.

Archeological and historical. No known archeological or registered historical sites would be affected by this alternative at Alki. An archeological site has recently been discovered across the Duwamish river from the Diagonal Way site. The Diagonal Way site should be investigated before construction.

Health and safety. There may continue to be health risks associated with the consumption of shellfish due to the discharge of effluent, as discussed in the biological section of the EIS.

An unlikely safety hazard is accidental leakage of chemicals when they are in transport or handled on site. Although nearly every U.S. water and wastewater treatment facility uses chemicals, there have been very few chemical-related accidents.

The health and safety problems related to sludge transport and disposal would be as probable as for any other trucks in transit.

Construction safety risk would be as for any other similar construction: with safety-conscious procedures there should be little chance of accidents.

Aesthetics and nuisance. The Alki facility would be phased out, eliminating a major nuisance in the Alki area, but would be replaced in the Diagonal Way site; it is still being determined how much of a nuisance the Diagonal Way facility would be. Combined sewer overflows at Alki Point and along the Duwamish River would be controlled, which would remove much of their visual nuisance.

Under this alternative, 0.3 sludge truck per day would leave the Duwamish site. This would cause some nuisance on residential streets, but it is considered minor.

Mitigation Measures

While some odor-controlling measures have been implemented at Alki, odor remains a problem. Odor control is an important and feasible mitigation measure for this alternative until 1995 when the plant is abandoned. The costs of interim odor control are being calculated by Metro and will be available by the end of July, 1977.

Visual impacts of the facilities, which are highly visible by service area residents from above, could be mitigated by landscaping.

The effects on water quality and biota from BOD, solids, metals and toxicants identified or suggested for Alki/West Seattle until 1995 and for the Duwamish estuary thereafter could be reduced by employing enhanced primary treatment year-round instead of just in summer, as presently proposed.

The data base for evaluation of impacts on the Duwamish sites could be improved through thorough investigation of soils and foundation characteristics, socioeconomic characteristics and archeological sites.

An improved chlorine feed system can be designed to prevent chlorine levels in the sewage treatment plant effluent from exceeding toxic levels. This could be achieved by matching chlorine levels to effluent discharge and/or installing a chlorine contact tank, which would maximize the effectiveness of chlorination treatment. Currently, chlorine is injected into the effluent flow at a constant rate, calculated daily.

Further sites in the Duwamish area should be investigated as possible alternatives to the Diagonal Way location.

Unavoidable Adverse Impacts

Under this alternative, the following adverse impacts would be unavoidable.

Construction. Although construction activities can be screened from public view, they will still be a temporary nuisance.

Sludge trucking. Under current practices of disposing sludge at remote sanitary landfill sites, there will necessarily be sludge trucking.

Primary effluent effect on water quality and biota. This alternative does not implement secondary treatment; the minor water quality degradation of Puget Sound would continue as would effects on biota.

Noncompliance with PL 92-500. Public Law 92-500 requires the installation of secondary treatment. This alternative does not comply.

Land use. Land is required in all alternatives; the question is: where will the impact occur?

Aesthetic nuisance of plant location. Wastewater treatment facilities are a nuisance in all alternatives; the question is: how can these nuisances be made smallest?

Operation and maintenance and capital costs. Construction of wastewater facilities, interceptors, and CSO holding tanks is expensive. The facilities must be operated and maintained.

Energy expenditures. Energy can in part be provided by the methane produced in anaerobic digestion, but there is still a large expenditure of energy which cannot be mitigated.

ALTERNATIVE D
PARTIAL COMBINED SEWER OVERFLOW CONTROL

General Description

Similar to Alternative C, Alternative D is designed to reduce the combined sewer overflows to all receiving waters during the planning period, with priority given to the most sensitive use areas, specifically the inland waters. The Alki service area overflows would be reduced by provision of holding tanks for combined sewer overflows and additional transfer systems. A holding tank at Murray Avenue and other miscellaneous revisions to the collection system will be provided. The combined sewer overflows at Alki Beach would be 4.47 million gallons per year, more than Alternative C but less than Alternative B.

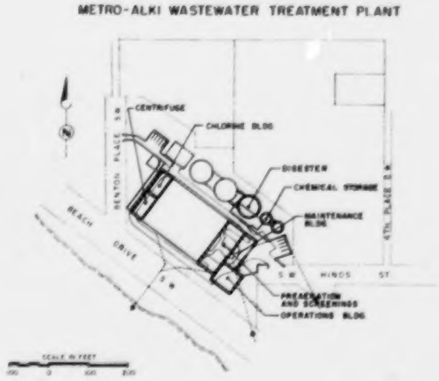
The Alki service area would remain as it exists currently, but the additional sewered population would produce 10 mgd average, 30 mgd peak flow to the plant.

Under this alternative, the Alki treatment plant would be upgraded to enhanced primary treatment in 1985 and would include chlorination facilities, pre-aeration and screening facilities, chemical feeding and storage, and sludge handling expansion with a digester and centrifuge, shown in Figure 3-6 With the exception of the new digester, the site would change little in appearance and the site area would be sufficient to accomodate the improvements.

The treatment process would be upgraded to enhance the BOD and suspended solids removal efficiencies during summer months only. Treated wastewater would be discharged through the Alki outfall, scheduled for major improvements.

The additional solids loads from growth and enhanced primary treatment would require a new anaerobic sludge digester. To reduce the volume of sludge and resulting sludge truck traffic, the sludge would be dewatered by centrifuge before being hauled to the Cedar Hills landfill site for disposal.

The expansion and modification of the treatment facilities would be located on the present site and, therefore, additional land will not be required. The construction cost is estimated at $15 million. The service area and collection system under this alternative are similar to those under present conditions.


METRO-ALKI WASTEWATER TREATMENT PLANT
CENTRIFUGE
CHLORINE BLDG
DIGESTER
CHEMICAL STORAGE
MAINTENANCE BLDG
PREAERATION AND SCREENINGS
OPERATIONS BLDG
BENTON PLACE S.W.
47th PLACE S.W.
S.W. HINDS ST
BEACH DRIVE S.W.
SCALE IN FEET
0
100
200

ENHANCED PRIMARY

Figure 3-6

Alki Layout — — Alternative D

Impacts

Primary impacts only are discussed here; secondary impacts are evaluated in the Regional Analysis.

Geology, Soils and Topography

Alternative D requires construction of enhanced primary at Alki where bedrock is close to the surface. No plant would be built in the Duwamish, and no shoreline fill would be required. Construction at Alki may require heavy equipment or blasting to excavate for the foundations. The strength of the bedrock is not well known, but would be established through detailed site investigations prior to commencement of construction. The excavation of bedrock would affect topography, however, in a minor but irreversible way. Construction waste disposal could pose minor problems of limited extent but long duration. Earthquake hazards continue as in baseline conditions. More sludge would be generated by enhanced primary treatment, but the disposal site at Cedar Hills is expected to suffice on an interim basis. Sludge disposal impacts are evaluated in the regional analysis.

Outfall construction would have a major but limited and probably short-term and reversible adverse impacts on benthic sediments and on light transmittance in overlying waters. Information on existing Alki sediments is sparse. It is assumed that extending the outfall would improve nearshore sediments and initiate some changes in sediments in addition to those from construction further offshore near the new discharge point. The negative effects are potentially minor, as the effluent plume would be small, and limited in extent on the sediment of Puget Sound.

Earthquake damage to the outfall line could result from shock waves or from submarine landslides (if the strata are arranged appropriately which has not been determined). A break in the line would allow effluent to boil up through the opening. As this effect would have approximately the same magnitude and probability of occurrence for all alternatives, it has not been further evaluated here.

Overall, the impacts of Alternative D with respect to slope and stability of foundations and earthquake potential damage are major and adverse. Erosion and deposition problems are considered to be minor, limited in extent, and of short duration (less than five years) and reversible. The effect on marine sediments of the improved outfall and the effects at the sludge disposal site would be as in Alternative B.

Air Quality and Odors.

All of the strategies including Alternative D involve the handling of chlorine and raw sewage. The alternatives also require the operation of the sewage collection system in which hydrogen sulfide, methane and other products of anaerobic decomposition commonly collect. All of them involve the use of diesel and gasoline engines, both in pumping and treatment plant operations and for routine transportation and commuting. In high enough concentrations, chlorine, sulfur dioxide, hydrogen sulfide, and methane can be dangerous to human health. Chlorine and methane are also explosive. The dangers from these gases are well known.

Odors at the Alki plant have been a recurring problem. Extension of the Alki outfall would improve odors somewhat, as would controlling combined sewer overflows in the service area. The pollutant load reduction at the Alki overflow would be only 18%. Odors at the plant, then, would persist, causing moderately unpleasant conditions over a limited area.

Construction would generate dust, temporarily increasing the ambient particulates level, and emissions from machinery and equipment would temporarily raise local air pollution levels.

The potential odor problems associated with the proposed holding tanks are discussed in the Regional EIS.

Water Quality

Under Alternative D, primary treatment at Alki would be enhanced by alum addition in summer for greater solids removal (22%). An 18% reduction would occur in combined sewer overflows to the Alki area (Metropolitan Engineers, 1977). The Alki outfall would be extended.

No impact is expected on temperature, DO, salinity or BOD at beaches, nearshore or offshore. Nutrients and pathogens entering the intertidal would probably be improved by extending the outfall. The adverse impacts of nutrients from remaining CSO's would probably be minor, because the discharge is not large; limited to Alki/West Seattle beaches; long-term, because the discharge would continue through the planning period; and reversible. Enhanced primary treatment alone would have little benefit with respect to nutrients, as phosphates are apparently never limiting and nitrates are not removed. The impact from suspended solids along beaches would continue through the planning period; and reversible.

At the beaches, coliform levels should be lower in summer as CSO's are rarer then, and the outfall would be extended. Remaining coliform problems at beaches would probably be minor, limited in extent, but long-term. Coliforms offshore and nearshore would be greatly reduced.

Heavy metals and toxicants inputs would also be reduced to a minor-to-moderate extent by alum addition to effluent and some overflow control. The impact is judged to be positive and minor, but long-term.

Risk of toxic chlorine residuals nearshore would be reduced by extending the outfall and addition of a diffuser section to improve initial dilution.

Outfall construction would entail excavation of marine sediments, with resulting increased turbidity in the overlying waters and resuspension of metals and toxicants. The effects are judged to be adverse and moderate, but highly limited in extent, short-term and reversible.

Primary impacts on groundwater levels, Duwamish water quality and Elliott Bay water quality would be the same as under Alternative B. Secondary impacts on Duwamish water quality from the expansion of Renton are discussed in the Regional EIS which is Volume I of this series.

Biology

Implementation of Alternative D would include an 18% decrease in CSO's to West Seattle. CSO's to Elliott Bay would increase 21 percent relative to Alternative B. The Duwamish flows would continue at baseline (B) levels, but loads of BOD and solids would decrease by 24 and 29 percent, respective to Alternative B, due to the installation of enhanced primary treatment at Alki. The Alki outfall would be improved.

Terrestrial habitats. Impacts are expected to be negligible, as construction would impact only marginal habitats. If landscaped, impacts on-site could be positive as shrubs and trees would provide new habitats for wildlife.

The intertidal. Intertidal organisms would be affected by continued effluent nutrient loads and perhaps pathogens. Loads of BOD and solids and perhaps metals would be reduced. Overflows at Puget Sound would be reduced 18 percent at West Seattle, but would increase 21 percent at Elliott Bay, relative to Alternative B. The Alki outfall would be improved, reducing substantially the potential for effluent affecting the intertidal.

Continued nutrient (nitrogen) loads would maintain probable enrichment effects on intertidal algae and algae grazers.

Metals levels at the outfall area could continue to be higher than at background stations (Point No Point), since chemical precipitation would be employed only in summer. Metals removal with enhanced primary treatment is somewhat but not consistently better than with primary.

Pathogens could continue to reach the intertidal through CSO's and effluent coming ashore, probably maintaining bacterial levels that exceed state shellfish standards. The design of the extension of the Alki outfall could probably prevent effluent from coming up on the beach, as is highly likely at present. Eelgrass beds would also be benefited by the extension of the Alki outfall and somewhat by summer chemical precipitation treatment of Alki effluent.

Puget Sound. Nearshore and offshore life are affected more by effluents than by overflows which disperse along shore. The Alki outfall would be extended and improved. The extended Alki outfall would place the effluent closer to mid-channel where major algae blooms develop. It is not known whether or not any new effects would occur as a result.

The distribution of some nearshore and offshore benthic organisms appears to be correlated with the characteristic plume positions for West Point and Carkeek effluents. Similar effects probably occur at Alki, but have not been examined. Those effects connected with nutrient enrichment are assumed to continue and those connected with solids and other loadings to decrease in magnitude with enhanced primary treatment.

Offshore free-swimming organisms may continue to be affected by effluents if they swim into or through an effluent patch, congregate around the outfall, or feed in nearshore areas at night. The effect at Alki is unknown, but is potentially minor, limited in extent to the plume dispersion, of short duration and reversible except for metals and toxicants.

The composition, diversity and abundance of fishes off the Alki outfall could probably change as overall BOD and solids loads to the Sound through the outfall would decrease with enhanced primary treatment.

Continuation of present chlorination practices, i.e. constant daily feed rate regardless of hourly effluent flow rate, tends to result in overchlorination and/or underchlorination. At Alki the initial dilution of the effluent is 10:1, which is not sufficient to dilute 0.5 mg/l chlorine residual (average) to safe levels (0.02 mg/l; Brungs, 1976). With the extension of the outfall and addition of a diffuser structure the effect is expected to be greatly reduced or eliminated.

Commercial and sport fisheries. Herring fisheries at West Seattle would be slightly benefited by the 18% decrease in CSO's, metals, toxicants, oil and grease to eelgrass bed areas. The salmon and trout runs up the Duwamish through Elliott Bay, however, would continue to be potentially threatened by overflows at present levels from BOD, solids, metals, and toxicants. Sport shellfish would probably continue to be a potential health risk as fecal coliforms in the waters exceed state shellfish standards. Effects on juveniles of commercial species that feed in nearshore areas potentially affected by effluents would be unchanged from present except that eelgrass beds would be less affected.

The above effects are considered to be reversible, ex tensive on the fisheries, and of long duration.

The Duwamish estuary. Annual volumes of sewer overflows to the Duwamish would remain at about baseline levels under Alternative D. The ecology of the Duwamish is discussed in the Regional EIS.

Rare and endangered species. No impacts are anticipated under Alternative D for rare species as none are recorded from the study area. Critical habitats such as salmon rearing and migration areas, and waterfowl areas have been discussed previously.

Natural Resources and Energy

Natural resources and energy impacts are not analyzed on a site-specific basis. Rather, these considerations are analyzed in the Regional Environmental Impact Statement on an interrelated basis between the five existing Metro plants and potential new sites.

The Human Environment

Many of the human environment facets pertinent to the Alki site are discussed and evaluated only in the Regional EIS. This necessity to treat certain topics on a regional basis stems from the interrelatedness of the plants and the trade-offs between alternatives.

Land use. Under Alternative D, the addition of enhanced primary treatment would only require land space for a couple of additional tanks. This space is already available on the current facility site; no new space would be required.

Legal and institutional. Legal issues are developed in the Regional EIS. This alternative does not fulfill the requirements of PL 92-500.

Agency and neighborhood goals. This alternative fulfills the goal stated by the PSCOG that "existing public utilities, facilities, and services shall be used to their fullest prior to expansion" but does not fulfill the goals of the King County Comprehensive Plan that "where pollution conditions now exist, all possible steps should be taken to correct such conditions."

This alternative does not fulfill the goals of the Alki community council that: "If it is economically and technically feasible, the unanimous vote of the committee is to close down the Alki plant. The property, including the Bar S playfields, should be reserved for use as park and recreation area for the neighborhood and for Seattle residents."

Employment and costs. Employment and cost considerations are developed in the Regional EIS.

Social, recreational, and cultural. Under this alternative, the Bar S baseball diamonds would not be affected, which is considered favorable, minor, long-term, reversible, local, and definite. However, degradation of the water near the Alki outfall would continue with only primary treatment, discouraging the recreational use of area beaches. This effect would be less than under existing conditions for two reasons: first, the Alki facility's outfall would be extended; and, second, combined sewer overflows will be partially controlled.

Implementation of advance primary treatment at this site may temporarily cause added traffic buildup in an area that is already congested with beach traffic.

Archeological and historical. No known archeological or registered historical sites would be affected by this alternative.

Health and safety. There may continue to be health risks associated with the consumption of shellfish due to the discharge of effluent, as discussed in the biological section of the EIS.

An unlikely safety hazard is accidental leakage of chemicals when they are in transport or handled on site. Although nearly every U.S. water and wastewater treatment facility uses chemicals, there have been very few chemical-related accidents.

The health and safety problems related to sludge transport and disposal would be as probable as for any other trucks in transit.

Construction safety risk would be as for any other similar construction: with safety conscious procedures there should be little chance of accidents.

Aesthetics and nuisance. The Alki treatment facility would continue to be a nuisance to local residents. It would still have an industrial appearance and could still be responsible for odors. These impacts would be adverse, major, long-term, local, irreversible, and definite.

Although enhanced primary treatment produces more sludge than primary treatment, the sludge dewatering facilities provided in this alternative significantly reduce the volume of the sludge, and, hence, the number of truck trips required for ultimate disposal. Under this alternative, 0.6 sludge trucks per day would leave the Alki facility. This would cause some nuisance on residential streets, and some congestion along an already crowded beach front but the impact is considered minor.

Mitigation Measures

While some odor-controlling measures have been implemented, odor remains a problem at Alki. Odor control is an important and feasible mitigation measure for all alternatives. The costs of odor control are being calculated by Metro and will be available by the end of July, 1977.

Visual impacts of the facilities, which are highly visible by service area residents from above, could be mitigated by landscaping.

The effects on waters, sediments and biota off Alki Point from BOD, solids, metals and toxicants identified or suggested could be further reduced by employing enhanced primary treatment year-round instead of just in the summer.

An improved chlorine feed system can be designed to prevent chlorine levels in the sewage treatment plant effluent from exceeding toxic levels. This could be achieved by matching chlorine levels to effluent discharge and/or installing a chlorine contact tank, which would maximize the effectiveness of chlorination treatment. Currently, chlorine is injected into the effluent flow at a constant rate, calculated daily. This causes a fluctuating chlorine residual.

Unavoidable Adverse Impacts

Under this alternative, the following adverse impacts would be unavoidable.

Construction. Although construction activities can be screened from public view, they will still be a temporary nuisance.

Sludge trucking. Under current practices of disposing sludge at remote sanitary landfill sites, there will necessarily be sludge trucking.

Alternatives and Impacts
Alternative D

Enhanced primary effluent on water quality and biota. This alternative does not implement secondary treatment; the minor water quality degradation of Puget Sound would continue as would effects on biota.

Noncompliance with PL 92-500. Public Law 92-500 requires the installation of secondary treatment. This alternative does not comply.

Land use. Land is required in all alternatives; the question is: where will the impact occur?

Aesthetic nuisance of plant location. Wastewater treatment facilities are a nuisance in all alternatives; the question is: how can these nuisances be made smallest?

Operation and maintenance and capital costs. Construction of wastewater facilities, interceptors, and CSO holding tanks is expensive. The facilities must be operated and maintained.

Energy expenditures. Energy can in part be provided by the methane produced in anaerobic digestion, but there is still a large expenditure of energy which cannot be mitigated.

ALTERNATIVE E, G, AND H

SECONDARY

Although the three alternatives are different on the regional level, they all provide for upgrading the Alki plant by 1983 to secondary treatment by the activated sludge process in order to comply with PL 92-500. Under these alternatives, there would be no change in the present service area. Major additions or upgrading of the collection system would not be provided. Measures to reduce combined sewer overflows would not be taken either, and overflows during wet weather would continue. However, overflows at the pumping stations due to power failures would be eliminated. Engine generators, as well as other improvements, would be provided at each station.

The secondary process would include, in addition to the existing primary facilities, aeration basins, secondary clarifiers, chlorination facilities, and a chlorine contact basin. The present pre-aeration, screening facilities, and operation and maintenance buildings would be expanded. A layout of the plant is shown in Figure 3- 7.

Sludge handling facilities would also be expanded to handle additional sludge quantities resulting from secondary treatment and additional sewered population. A new anaerobic digester would be provided. To reduce the sludge volume and truck traffic, the sludge would be dewatered by centrifuge at Alki before being hauled to Cedar Hills landfill for disposal.

The present outfall would be upgraded and extended to provide adequate mixing of the effluent in Puget Sound.

The Alki plant upgrading and new structures would require the acquisition of an additional 4.6 acres of publicly and privately owned land located northwest of the site, which is currently a public playground. Due to the higher elevation of the playground area, a pumping station would be required to pump the settled sewage from the primary tanks on the existing site to the aeration tanks. The entire Alki project is estimated to cost $26.5 million. Sludge generated in the treatment process would be digested and dewatered on-site and hauled to the Cedar Hills landfill as part of the regional interim sludge handling and disposal plan.

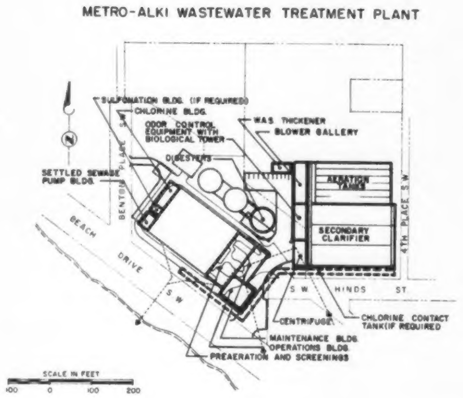

METRO-ALKI WASTEWATER TREATMENT PLANT
SULFONATION BLDG. (IF REQUIRED)
CHLORINE BLDG.
ODOR CONTROL EQUIPMENT WITH BIOLOGICAL TOWER
W.A.S. THICKENER
BLOWER GALLERY
DIGESTERS
SETTLED SEWAGE PUMP BLDG.
AERATION TANKS
SECONDARY CLARIFIER
BENTON PLACE S.W.
4TH PLACE S.W.
BEACH DRIVE S.W.
S.W. HINDS ST
CENTRIFUGE
CHLORINE CONTACT TANK(IF REQUIRED
MAINTENANCE BLDG.
OPERATIONS BLDG.
PREAERATION AND SCREENINGS
SCALE IN FEET
100
0
100
200

Figure 3-7

Alki Layout — — Alternatives E, G, and H

Impacts

Primary impacts only are discussed here; secondary impacts are evaluated in the Regional Analysis.

Geology, Soils and Topography

Alternatives E, G and H would require significant expansion of the Alki treatment facility for secondary treatment taking half of the space now used by the Bar S recreation fields. Construction would require excavation of the bedrock. There would be no significant adverse effect on the soils and geology of the site from construction. Shoreline fill would not be required, and no special soil engineering measures should be necessary. The strength of the bedrock is not well known but would be established through detailed site investigation prior to construction. Potential earthquake damage is major. Potential for erosion is minor. Disposal of construction waste could also pose a minor problem, limited in extent but of long duration.

Outfall construction would have a major but limited and probably short-term and reversible impact on benthic sediments and light transmittance in overlying waters. It is assumed that the outfall could mean an improvement in nearshore and intertidal sediments potentially affected formerly in a minor way by effluent moving onshore as a result of tidal currents as at West Point. It is further assumed that the extended outfall would initiate some changes in sediments, in addition to those from construction, further offshore near the new discharge point. The negative effects are potentially minor, as the effluent plume would be small, and limited in extent on the sediment of Puget Sound.

Earthquake damage to the outfall line could result from shock waves or from submarine landslide (if the strata are arranged appropriately). A break in the line would allow effluent under pressure to boil up through the opening. The probability of this event is the same for all alternatives and is thus not further evaluated herein.

Building on the playfields would result in irreversible changes to the soils underlying them and increase runoff at the site. Erosion potential would increase during construction.

Air Quality and Odors

Upgrading the Alki plant to secondary treatment would increase the potential for odors escaping into the surrounding neighborhood. Because secondary treatment plants are larger and more complex than primary plants, expose more water surface area to the air and subject the water to more perturbation, there is a greater likelihood for odors being released into the surrounding neighborhood from secondary treatment plants. Uncontrolled CSO's would continue to cause intermittent odor problems. Improvement of the outfall would reduce, or perhaps eliminate, the potential for odors arising from the discharge plume. The net result of these alternatives would be an increased potential for unpleasant odors escaping to the surrounding neighborhood.

Water Quality

Under Alternatives E, G and H, secondary effluent would be discharged through a modified Alki outfall. Flows would be at baseline levels, but BOD and solids would be reduced 65 to 76 percent. Combined sewer overflows would continue and increase with growth in sewered areas, as in baseline (B) conditions. Nutrient (nitrogen) loads would continue as in Alternative B from effluent discharge.

Temperature, DO and salinity would not be measurably affected. Nutrients would be reduced onshore with extension of the outfall, but still be introduced by CSO's. Nutrients offshore would not be affected. CSO's would also continue to cause increased suspended solids levels on beaches on occadion.

Health risks associated with coliforms could be reduced somewhat through improvement of the outfall, but CSO's could still have adverse effects. The source of bacteria which cause shore waters to exceed fecal coliform standards for shellfish has not been identified.

Potential chlorine toxicity problems would be reduced by an improved, extended outfall and the addition of a chlorine contact tank.

The discharge of heavy metals, pesticides and toxicants would be substantially reduced by secondary treatment. Contributions of these contaminants from uncontrolled CSO's is unknown. Further studies are needed to compare the toxicants in the Alki treatment plant discharge, which is continual, and in CSO discharge, both of which probably have intermittent but recurring impacts on beach and nearshore waters.

Biology

Alternatives E, G and H would involve secondary treatment at Alki. Flows would continue at baseline levels, but solids and BOD loads would be reduced 65 to 76 percent. Overflows and loads to Elliott Bay, West Seattle beaches and to the Duwamish would continue at baseline levels. The Alki outfall would be extended and improved.

Terrestrial habitats. Expansion of the site for secondary treatment would occupy an existing ballfield, which is not considered to be an important terrestrial habitat. If the new sites are landscaped, the shrubs and trees could be beneficial in providing terrestrial wildlife a more diverse habitat.

The intertidal. Overflows to Puget Sound at Alki/West Seattle and Elliott Bay would remain at present annual levels of 5.46 million gallons and 358 million gallons, respectively. Alki treatment plant effluent, which is assumed to reach adjacent beaches at least occasionally, would continue at baseline levels but solids and BOD (and perhaps metals and toxicants) loads would be reduced 65 to 76 percent. Elliott Bay shores are probably not affected by effluents.

Nutrients, which could potentially be implicated in increased growth rates of intertidal plants at Alki, would probably not be removed in significant amounts by secondary treatment of effluent and would, therefore, enter Puget Sound in continued baseline amounts. Coliform bacteria in shellfish could decrease somewhat, reducing health risks from consuming them, if chlorination facilities are improved, and with the extension of the Alki outfall. Bacterial and pathogen inputs from CSO's would continue, however, and it is impossible to determine whether or not state bacterial standards for shellfish waters would be met. Better chlorination would also reduce the risk of chlorine toxicity.

The reduction in solids, BOD and metals is considered to be a minor limited benefit, as effects from these parameters have not been demonstrated on the intertidal. Metals levels are slightly higher near outfall areas, but below existing standards. Toxicants levels in effluents are unknown, but removals in secondary treatment would have a positive effect. The benefit of metals and toxicants removals would be long-term, no matter how small.

It is not known which affects the intertidal community more overall - CSO's or effluent. Effluent quantity is two orders of magnitude larger, and quality is generally fairly well known (except for toxicants and trace elements), but its frequency of contact with the intertidal is not. CSO quality, on the other hand, is poorly known, quantity relatively small, but frequency of occurrence has been evaluated.

Puget Sound. Secondary treatment could potentially include improved disinfection - better kill with half the chlorine. BOD, solids, and probably metals and toxicant loads would be significantly reduced. Nutrient inputs would continue at baseline levels. The extension of the Alki outfall would reduce impacts to the nearshore areas, but add nutrients closer to a mid-channel area where plankton blooms develop. CSO's to Puget Sound waters would be as in baseline conditions. Offshore free-swimming and bottom dwelling organisms would be exposed to effluents containing substantially less solids, metals and toxicants.

The assumed influence of the Alki effluent plume on benthic community composition would continue the effects due to nutrients; effects of solids and organic matter would decrease. The abundance of clams and worms at the 150 foot contour could become less pronounced.

The composition of fish assemblages near the outfall may or may not change with secondary treatment. Some fishes may be attracted to the organisms on the pipe or to the pipe itself and would remain. Fishes which may be attracted by prey species favored by effluent-caused changes in the bottom or in the water column may also remain, although the waters and substrates would be affected less. Any effect on fishes would probably be short-term and reversible as many of these species are transient in this area.

Eelgrass beds would benefit from the metals and toxicants removals in secondary treatment, but not from the BOD and solids removals as these areas are already rich in organic matter.

Commercial and sport fisheries. Fish runs up the Duwamish through Elliott Bay would be affected by CSO's at unchanged levels from baseline (1975 or Alternative B). Herring fisheries at Alki would be exposed to baseline levels of CSO's, but the extension of the Alki outfall would provide a benefit in that effluent would reach the beaches less often or not at all depending on design.

Juvenile herring and salmonids feeding in eelgrass beds and other nearshore areas occasionally affected by effluents would be benefited somewhat by the decrease in toxicants and metals loadings which could build up in time in their prey. The possibility of chlorine toxicity would probably be eliminated by extension and improvement of the outfall. The benefit is considered to be minor-to-moderate, and long-term as effluent flows and CSO's would continue.

The Duwamish estuary. Overflows to the Duwamish would continue essentially at baseline levels. The ecology of the Duwamish is discussed in the Regional EIS.

Rare and endangered species. No rare or endangered species are recorded from the study area. Sensitive habitats have been described previously.

Natural Resources and Energy

Natural resources and energy impacts are not analyzed on a site-specific basis. Rather, these considerations are analyzed in the Regional Environmental Impact Statement on an interrelated basis between the five existing Metro plants and potential new sites.

The Human Environment

Many of the human environment facets pertinent to the Alki site are discussed and evaluated only in the Regional EIS. This necessity to treat certain topics on a regional basis stems from the interrelatedness of the plants and the tradeoffs between alternatives.

Land use. Under these alternatives, the Alki treatment plant would be expanded to include secondary treatment, requiring the land of one of the two Bar S baseball playing fields. This land is currently owned by Seattle Department of Parks and Recreation; Metro has an option on it. The impact of using this land is considered adverse, minor, long-term, local, irreversible, and definite.

Construction would require a permit from the Seattle Shorelines Master Plan, and perhaps other agencies.

Legal and institutional. Legal issues are developed in the Regional EIS. These alternatives fulfill the requirements of PL 92-500. The timing involved in completing secondary treatment construction is of consideration, as is explained in the Regional EIS.

Agency and neighborhood goals. These alternatives fulfill the goal stated by the PSCOG that "existing public utilities, facilities, and services shall be used to their fullest prior to expansion" and, in part, fulfill the goals of the King County Comprehensive Plan, that, "where pollution conditions now exist, all possible steps should be taken to correct such conditions."

These alternatives do not fulfill the goals of the Alki community council that: "If it is economically and technically feasible, the unanimous vote of the committee is to close down the Alki plant. The property, including the Bar S playfields, should be reserved for use as a park and recreation area for the neighborhood and for Seattle residents."

Employment and costs. Employment and cost considerations are developed in the Regional EIS.

Social, recreational and cultural. Under this alternative, one of the two baseball diamonds at the Bar S field would be used for expansion of the facility. Although the Alki residents hope to keep the Bar S playing fields intact, they would prefer to condemn these fields rather than condemn more private property. The impact of this recreational restriction would be adverse, minor, long term, local, irreversible, and probable.

Expansion at this site may temporarily cause added traffic buildup in an area that is already congested with beach traffic.

This alternative would improve the water quality off Alki point, which may make the Alki beaches more attractive for recreation. This would tend to balance the loss of recreational opportunity at the ballfield.

This alternative would have no impact in the Duwamish area, as it includes no expansion into that area.

Archeological and historical . No known archeological, or registered historical sites would be affected by this alternative.

Health and safety. There may be fewer health risks associated with the consumption of shellfish due to the discharge of secondary effluent rather than primary, as discussed in the biological section of the EIS.

An unlikely safety hazard is accidental leakage of chemicals when they are in transport or handled on site. Although nearly every U.S. water and wastewater treatment facility uses chemicals, there have been very few chemical-related accidents.

The health and safety problems related to sludge transport and disposal would be as probable as for any other trucks in transit.

Construction safety risk would be as for any other similar construction: with safety conscious procedures there should be a slim chance of accidents.

Aesthetics and nuisance. The Alki treatment facility would continue to be a nuisance to local residents; it would still have an industrial appearance and could still be responsible for odors. Expansion could cause odor impacts to increase, because of greater potential for contact between air and the wastewater. These impacts would be adverse, major, long-term, local, irreversible, and definite.

Although secondary treatment produces more sludge than primary treatment, the dewatering facilities provided in these alternatives significantly reduce the volume of sludge and, hence, the number of truck trips required for ultimate disposal.

Mitigation Measures

While some odor-controlling measures have been implemented at Alki, odor remains a problem. Odor control is an important and feasible mitigation measure for all alternatives. The costs of odor control are being calculated by Metro and will be available by the end of July, 1977.

The adverse impacts on neighborhood recreational opportunities ensuing from expansion of the Alki facility onto one of the two adjacent ballfields could be mitigated somewhat by installing tennis courts on top of the secondary clarifiers.

Visual impacts of the facilities which are highly visible by service area residents from above, could be mitigated by landscaping.

Unavoidable Adverse Impacts

Under this alternative, the following adverse impacts would be unavoidable.

Construction. Although construction activities can be screened from public view, they will still be a temporary nuisance.

Sludge trucking. Under current practices of disposing sludge at remote sanitary landfill sites, there will necessarily be sludge trucking.

Combined sewer overflows. This alternative does not take adequate measures to control CSO's; they will still occur in wet weather.

Land use. Land is required in all alternatives; the question is: where will the impact occur?

Aesthetic nuisance of plant location. Wastewater treatment facilities are a nuisance in all alternatives; the question is: how can these nuisances be made smallest?

Operation and maintenance and capital costs. Construction of wastewater facilities, interceptors, and CSO holding taks is expensive. The facilities must be operated and maintained.

Energy expenditures. Energy can in part be provided by the methane produced in anaerobic digestion, but there is still a large expenditure of energy which cannot be mitigated.

ALTERNATIVE F

SECONDARY TREATMENT/SOUTHERN STRATEGY

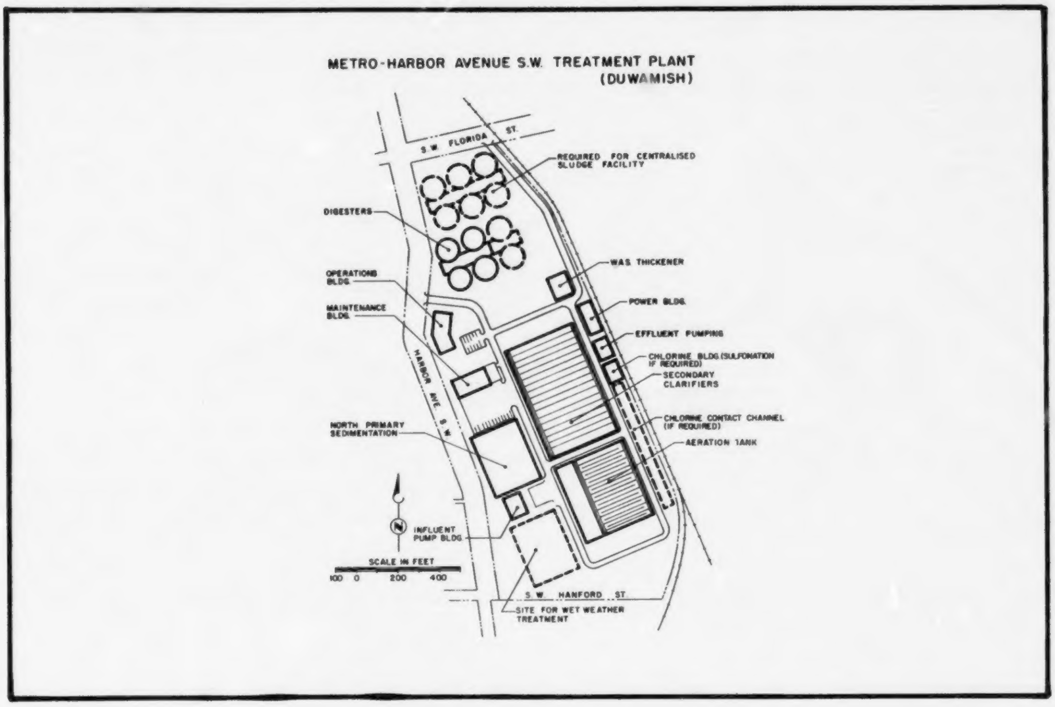
Similar to Alternative C, the treatment plant at Alki would be entirely abandoned and the site vacated (see Figure 3-5), but this change would occur earlier in Alternative F, by 1985. Flows from the Alki service area during both dry and wet weather would be transferred to and treated at the new Duwamish treatment plant.

The new 50 mgd secondary treatment plant would be constructed in the lower Duwamish by 1985, adjacent to the existing Duwamish pumping station on Harbor Avenue. In addition to serving the Alki area, the plant would serve the southerly portion of the West Point service area. A possible layout of the plant is shown in Figure 3-8. The Duwamish plant would treat 50 mgd average, 145 mgd peak flows.

Modifications to the existing Renton collection system would be required to bring Renton flows to the Duwamish plant. Plant effluent would be transferred to Alki Point via the same tunnel used for transferring Alki wastewater, with discharge to Puget Sound through a new outfall and diffuser. The effluent tunnel and outfall would be sized for the inclusion of Renton effluent, thus removing Renton discharge from the Duwamish River at a later date. This would require construction of a new Renton transfer line to an effluent pumping station located at the Duwamish plant.

Sludge facilities at the Duwamish plant would include digesters sized to serve the Alki and south West Point service area, plus sludge storage and receiving facilities sized for handling Renton and West Point sludges. Space would also be made available for construction of dewatering equipment at a later date as dewatered sludge reuse options become more definite.

Under this alternative, the combined sewer overflows to Puget Sound would be reduced. The overflows at the plant and 63rd Street pumping station would be eliminated due to the abandonment of the former and enlargement of the latter. Overflows due to power failure at the various pumping stations would be eliminated also, since provisions are made under this alternative to include an engine generator at each station.


METRO-HARBOR AVENUE S.W. TREATMENT PLANT
(DUWAMISH)
S.W. FLORIDA ST.
REQUIRED FOR CENTRALISED SLUDGE FACILITY
DIGESTERS
WAS. THICKENER
OPERATIONS BLDG.
MAINTENANCE BLDG.
POWER BLDG.
EFFLUENT PUMPING
CHLORINE BLDG.(SULFONATION IF REQUIRED)
SECONDARY CLARIFIERS
HARBOR AVE. S.W.
CHLORINE CONTACT CHANNEL (IF REQUIRED)
NORTH PRIMARY SEDIMENTATION
AERATION TANK
N
INFLUENT PUMP BLDG.
SCALE IN FEET
100
0
200
400
S.W. HANFORD ST.
SITE FOR WET WEATHER TREATMENT

SECONDARY – – AIR ACTIVATED SLUDGE

Figure 3-8

Alki Layout – – Alternative F

Impacts

Primary impacts only are discussed here; secondary impacts are evaluated in the Regional EIS.

Geology, Soils and Topography

Alternative F includes abandonment of the Alki facility with construction of a new secondary treatment plant in the Duwamish. The Alki outfall would be improved and carry flows from both the new plant and from Renton. A slightly larger tunnel than in Alternative C would be opened under West Seattle and the Duwamish River, a major construction project. The effects of the tunnel would be about the same as in Alternative C. Stability is not expected to be a major problem in the glacial deposits affected. There is, however, some risk of reducing the stability of adjacent bluffs, particularly near the portals. Disposal of muck from the tunnel excavation may pose a major environmental problem, depending on where this material is taken for disposal.

The currently favored Duwamish sites are in areas of deep alluvial or fill deposits, and any structures erected there would require piling and dewatering for foundation support. Necessary pre-construction studies of local soil conditions and the special precautions necessary to ensure stable foundations would add to the duration and cost of construction. Such soils also carry the highest earthquake hazard risks. The precautions necessary to deal with the above hazards are well known, however. The impact of construction waste (debris) disposal could be adverse, minor and limited in extent but of long duration on the ultimate disposal site(s) due to materials leaching out of the waste.

At Alki, the treatment plant would be dismantled and the site graded to the level of the existing adjacent ballfield. This process would, like construction, generate dust, erosion potential and construction waste disposal site concerns.

The new outfall is assumed, as in other alternatives, to allow improvement in nearshore sediments near the present outfall site and initiate changes in the sediments at the new discharge point. The impact is assumed to be moderate as the plume will be 18 times larger, limited in extent, irreversible and long-term, as non-degradable industrial wastes would be entering Puget Sound from the Renton facility.

Air Quality and Odors

The odor problems associated with the Alki treatment plant would be eliminated by abandonment of Alki. A new secondary treatment plant in the Duwamish valley, which is subject to poor air circulation, frequent temperature inversions, and already high pollutant loads, would create a potential for odor problems in this area. The secondary treatment plant could be more of an odor problem than the enhanced primary plant of Alternative C, because secondary treatment plants are larger and more complex than primary plants, expose more water surface area to the air and subject the water to more perturbation.

Although the Duwamish plant would discharge off Alki Point, the extended outfall should reduce or eliminate the potential for odors arising from the discharge plume.

Water Quality

Under Alternative F, a new secondary treatment facility would be built in the Duwamish. Duwamish wastewater and Renton secondary effluent would both be discharged through a new Puget Sound outfall at Alki Point. CSO abatement depends on facility sizing, but is expected to be essentially complete (97%) at Alki Beach (Metropolitan Engineers, June, 1977).

Therefore, a singificantly large flow of chlorinated effluent would be discharged to Puget Sound at Alki, but of higher quality (secondary treatment) than at present. Combined Renton and Duwamish flows are expected to average 144 mgd, with peak flows of 404 mgd. These flows would be almost 50% larger than the West Point secondary plant under F, based on average flows (144 mgd versus 97 mgd). Solids and BOD loads would be similarly larger. This major new point source at Alki could have effects of unknown magnitudes, but possibly similar to those at West Point. Outfall design will determine whether or not effluent from the new outfall reaches the shore due to the current patterns at the Point.

Nutrients inputs would increase drastically at this point with the 18-fold increase in effluent flows. Solids and BOD loads would increase 4.5 times and 3.4 times over base level inputs to the Sound at Alki. The new outfall would discharge near one of the two areas in central Sound where major algae blooms develop. It is not known whether or not any effects would result on primary productivity.

The increase in BOD and solids load to Puget Sound at Alki could be paralleled by an increase in metals and toxicants loads, perhaps of similar magnitudes. At the same time, CSO abatement should reduce heavy metals and toxicants in beach and nearshore waters.

In summary, large flows of secondary treated wastewater, in spite of CSO abatement, should increase the loads of nutrients, solids, BOD, heavy metals, and toxicants to nearshore and perhaps beach waters at Alki. The benefits of secondary treatment offshore appear to be overshadowed by the substantially increased flows and loads passing through the Alki outfall from the Renton and Duwamish treatment plants. Because the Renton and Duwamish service areas include more industry than that of Alki, the volume of heavy metals and toxicants discharged would also increase. More information is needed on the tradeoffs involved in this alternative before accurate conclusions can be reached. The benefits to the Duwamish River of transferring Renton and Duwamish discharges to Puget Sound are discussed in the Regional EIS.

Biology

Under Alternative F, all effluents would receive secondary treatment. The effluent from a new secondary plant in the Duwamish and from Renton would enter Puget Sound through a new improved outfall at Alki, creating a major point source of 144 mgd, about 50% larger than West Point at that time (97 mgd). Most of the facilities at Alki would be abandoned and removed. Overflows to Alki/West Seattle would be reduced by 97%.

Terrestrial habitats. The removal of the treatment plant at Alki would allow for development of a park at the site. The trees and shrubs would create habitat diversity beneficial to wildlife. The effect could be moderate, limited in area, and of long duration. Such landscaping, however, is not part of the alternative costs shown.

The intertidal. Overflows to Puget Sound would be reduced - 15% to Elliott Bay, 97% to Alki. Flows entering the Sound at Alki would increase by 15 times, BOD by 3 times, and solids by 4 times. Because of physiographic similarities, it is possible that effluent from a new Alki outfall would come inshore just as at West Point and as assumed at Alki now. The frequency of such an event cannot be determined, as it is unknown now and the properties of the new outfall are undetermined. The risk of chlorine toxicity in the intertidal would be reduced due to addition of a chlorine contact tank and improvements so that the outfall would be further offshore and would have a diffuser section. With CSO control and the new outfall, the bacterial levels in intertidal areas could be reduced. Whether or not state fecal coliform standards for shellfish waters would then be met cannot be determined as the source(s) of bacteria has not been identified.

Puget Sound. Loads of nutrients, BOD, solids and probably metals and toxicants would significantly increase at Alki.

Offshore phytoplankton would probably be affected by the higher level of nutrients, and the distribution may be altered through extension of the Alki outfall, such that an enrichment may develop near the outfall.

The major new plume would discharge near one of the two areas in central Sound where algae blooms develop. The increase seen in primary productivity extremes in the vicinity of West Point would appear similarly near the new Alki outfall from which effluent discharge would be 50% greater than West Point in 2005. The resulting effect on zooplankton is unknown. An enriching effect on the algal productivity of central Puget Sound is considered to be a moderate, negative impact, extensive and of long duration as flows continue, but reversible.

Coliform bacteria levels in waters could decrease, reducing health risk from consuming shellfish, with the extension and improvement of the Alki outfall. Overall bacterial and virus inputs to Puget Sound from overflows would increase, but would probably not be a problem in being dilute. Whether strict state fecal coliform standards would be met cannot be determined at this time. Improved chlorination could also reduce the risk of occasional chlorine toxicity of unknown magnitude to animals near the outfalls.

The apparent influence of the West Point effluent in benthic communities is assumed to occur similarly at Alki. Whatever the existing effect at Alki, it would be greatly increased by the larger nutrient, BOD and solids loads entering Puget Sound at this point. Loads of metals and toxicants would also increase, but by an unknown amount at this site even with secondary treatment.

The composition of the fish assemblage near the outfall may or may not change with secondary treatment and many fold increase in the size of the effluent plume, as the causes of attractions of particular species to the outfalls have not been identified. Those attracted to the pipe or the organisms which attach to it would remain or increase.

The slightly elevated incidence of tumorous flatfish at West Point may or may not change with secondary treatment of effluent, as the cause(s) of the phenomenon are unknown. It would be of value to monitor the incidence of tumorous fishes at Alki with the installation of the new outfall and greatly increased discharges at that point. In general, the existing nektonic and benthic community situation at Alki is so little described in the literature as to make judgements of future effects impossible.

Commercial and sport fisheries. The fish of the Duwamish -Elliott Bay would receive moderate benefit from 1) the transfer of Renton effluent to Alki with effluent from the Duwamish secondary plant and 2) a 15% decrease in overflows to the Elliott Bay. Flows, BOD and solids, would be reduced as would stresses due to low DO, metals and toxicants. The effects of the removal of Renton effluent are described in the Regional EIS.

Herring fisheries and eelgrass beds at Alki would probably benefit from the essential elimination (97% reduction) of overflows to the Alki/West Seattle beaches in Alternative F and from the extension of the Alki outfall. Juvenile and larval herring, salmonids and bottom fish feeding inshore in areas occasionally affected by effluents, would probably benefit from the decrease in toxicants and metals loadings which otherwise could accumulate in their prey. The beneficial impact could be minor to moderate, possible, somewhat limited in the central Sound and long-term as effluents continue.

The Duwamish estuary. CSO's to the Duwamish would remain at baseline (Alternative B) levels. The removal of Renton effluent is discussed in sections on secondary impacts in the Regional EIS. Primary impacts would continue to be minor-to-moderate, fairly extensive in the waterway and of long duration as continuing events. Effects would be essentially irreversible for metals and toxicants.

Rare and endangered species. No listed species are recorded from the study area. Sensitive habitats have been discussed previously.

Natural Resources and Energy

Natural resources and energy impacts are not analyzed on a site-specific basis. Rather, these considerations are analyzed in the Regional Environmental Impact Statement on an interrelated basis between the five existing Metro plants and potential new sites.

The Human Environment

Many facets of the human environment pertinent to the Alki site are discussed and evaluated only in the Regional EIS. This necessity to treat certain topics on a regional basis stems from the interrelatedness of the plants and the trade-offs between alternatives.

Land use. At Alki, the facility would temporarily continue with primary treatment which would not require the acquisition of new land; by 1985 the Alki facility would be abandoned, to be replaced by a secondary treatment facility at the Harbor Avenue site on the Duwamish.

The eventual abandonment of the Alki site would be favored in the Alki area. Data is being collected on the response of Duwamish area residents to a wastewater facility in their community.

Legal and institutional. Legal issues are developed in the Regional EIS. This alternative fulfills the requirements of PL 92-500.

Agency and neighborhood goals. This alternative fulfills the goals of the Alki community council that: "If it is economically and technically feasible, the unanimous vote of the committee is to close down the Alki plant. The property, including the Bar S playfields, should be reserved for use as a park and recreation area for the neighborhood and for Seattle residents."

This alternative also attempts to fulfill the priorities set by the PSCOG that "natural amenities identified as important to the region's character and beauty shall be preserved or sensitively developed as a second choice" by abandoning the Alki facility, which is on prime beach land; but does not fulfill the same agency's goal that "existing public utilities, facilities, and services shall be used to their fullest prior to expansion" when the still-operable Alki facility is abandoned.

Employment and costs. Employment and cost considerations are developed in the Regional EIS.

Social, recreational and cultural. The proposal of removing the Alki wastewater facility is greatly applauded by Alki residents. Under this alternative, the Bar S baseball diamonds would not be affected, which is considered favorable, minor, long-term, reversible, local, and definite. Further, the land which is currently used for the wastewater treatment facility could eventually be used for other recreational purposes.

Degradation of the water near the Alki outfall would be reduced with secondary treatment; further, the outfall would be extended into the Sound. These actions may increase the recreational usefulness of the Puget Sound water if the beneficial effects are not offset by the greatly increased flows.

It is now being determined what social, recreational and cultural effects a wastewater treatment facility will have on the Duwamish area.

Archeological and historical. No known archeological or registered historical sites would be affected by this alter alternative.

Health and safety. There may be fewer health risks associated with the consumption of shellfish due to the discharge of secondary effluent rather than primary effluent, as discussed in the biological section of the EIS.

An unlikely safety hazard is accidental leakage of chemicals when they are in transport or handled on site. Although nearly every U.S. water and wastewater treatment facility uses chemicals, there have been very few chemical-related accidents.

The health and safety problems related to sludge transport and disposal would be as probable as for any other trucks in transit.

Construction safety risk would be as for any other similar construction: with safety conscious procedures there should be a slim chance of accidents.

Aesthetics and nuisance. The Alki facility would be phased out, eliminating a major nuisance in the Alki area, but would be replaced by the Harbor Avenue site; it is still being determined how much of a nuisance the Harbor Avenue facility would be.

Under this alternative, 4.8 sludge trucks per day would leave the Duwamish facility. These would cause some nuisance, but the effect is considered minor; this traffic would probably not change ambient noise levels in this additional region.

Mitigation Measures

While some odor-controlling measures have been implemented at Alki, odor remains a problem. Odor control is an important and feasible mitigation measure for Alternative F until 1985 when the Alki plant is abandoned. The costs of odor control are being calculated by Metro and will be available by the end of July, 1977.

The currently unknown but potentially major effects of a large new point source to Central Puget Sound at Alki on sediments, water quality and biology and the means of preventing effluent from coming ashore could be identified and mitigated with a comprehensive study of the current, sediments, water quality and biology before outfall design begins. All of the field evaluations, theoretical and physical models could profitably be employed to this end.

Visual impacts of the facilities, which are highly visible by service area residents from above, could be mitigated by landscaping.

The data base for evaluation of impacts on the Duwamish sites could be improved through thorough investigation of soils and foundation characteristics, socio-economic characteristics, and archaeological sites.

Alternative sites to the Harbor Avenue location in the Duwamish area should receive continued attention.

Unavoidable Adverse Impacts

Under this alternative, the following adverse impacts would be unavoidable.

Construction. Although construction activities can be screened from public view, they will still be a temporary nuisance.

Sludge trucking. Under current practices of disposing sludge at remote sanitary landfill sites, there will necessarily be sludge trucking.

Land use. Land is required in all alternatives; the question is: where will the impact occur?

Aesthetic nuisance of plant location. Wastewater treatment facilities are a nuisance in all alternatives; the question is: how can these nuisances be made smallest?

Operation and maintenance and capital costs. Construction of wastewater facilities, interceptors, and CSO holding tanks is expensive. The facilities must be operated and maintained.

Energy expenditures. Energy can in part be provided by the methane produced in anaerobic digestion, but there is still a large expenditure of energy which cannot be mitigated.

SUMMARY OF IMPACTS

Geology, Soils and Topography

Potential impacts at the Alki and Duwamish sites were evaluated with respect to slope and foundation stability, earthquake damage risk, erosion and deposition, topography, soil damage risk, soil profile, and marine sediments. Sludge disposal and construction waste disposal site problems are evaluated in the Regional EIS. Duwamish sites were evaluated in Alternatives C and F.

As anticipated, those alternatives requiring the most construction have the greatest potential negative impact on land resources. All Alternatives but A include improvements to the Alki outfall; in C it would be abandoned in 1995, and in F it would carry 15 times the baseline flow. Alternatives C and F, which require major construction in the Duwamish, dismantling of existing structures at Alki plus the construction of a major tunnel from Alki to the new facility, are considered to carry the greatest potential negative impacts. The Duwamish sites are on fill; the Alki site is part moderately consolidated soils and part bedrock. All are subject to risk of major earthquake damage if structures are not constructed to withstand substantial ground shaking and differential settlement.

Alternatives E, G and H require expansion at the Alki site for secondary facilities, requiring one of the two adjacent ballfields. The impact of these alternatives is judged to be somewhat less than the construction of a new plant in the Duwamish area under Alternatives C and F, but still important. Alternative D requires less construction to accommodate enhanced primary facilities; Alternative B requires the least in just improving the Alki outfall.

Air Quality and Odors

Alternative A would continue the present odor problem at Alki. Odors could be reduced somewhat by outfall improvements under Alternatives B, C, D, E, G and H. Odors arising from treatment plant operation would continue under Alternatives B and D. Abandonment of the plant in 1995 under Alternative C or 1985 under Alternative F would eliminate the odor problem at Alki. Upgrading the secondary treatment as proposed in Alternatives E, G and H could exacerbate the current odor problem. The potential for generation of aerosols containing pathogens would increase with secondary facilities, but is considered to be negligible. Construction of new facilities would temporarily raise dust levels by a moderate degree over a limited area. Operation of a new enhanced primary treatment plant under Alternative C or a second treatment plant under Alternative F would create a potential for odor problems in the Duwamish area. The proposed holding tanks are discussed in the Regional EIS.

Water Quality

The waters near Alki are subject to contaminant inputs from a variety of sources, only some of which, such as effluents and CSO's are controllable by Metro. As a result, no proposed alternative completely eliminates impacts on water quality.

The extension and improvement of the Alki outfall in Alternatives B, C (until 1995), D, E, G and H is expected to reduce chlorine toxicity potential and pathogens, BOD, solids, metals and toxicants concentrations in nearshore and intertidal waters to an undetermined degree.

Overflows to Alki/West Seattle beaches would be reduced 97% by Alternatives C and F, and 18% by D. Alternatives E, G and H would continue such overflows at baseline (Alternative B) levels.

Effluent solids and BOD loads, and associated metals and toxicants loads would be reduced at Alki most by C when the plant is ultimately abandoned and discharge ceases. The loads would be transferred to the Duwamish estuary. Secondary Alternatives E, G and H reduce effluent loads most (70-77 percent) after C. Enhanced primary treatment in D moderately reduces loads by about 22% over baseline (B) levels, to the levels seen in 1975. Alternative D can be construed as a non-degradation over present levels, but secondary alternatives reduce loads significantly. Alternative F would introduce greatly increased loads off Alki from the Duwamish area.

Nutrients (nitrogen) loads would be at baseline levels in C (until 1995), D, E, G and H. In Alternative F, flows and nutrients which are not removed by secondary treatment, would increase 15-fold to the Sound at this point. Solids, BOD, and probably metals and toxicants loads to Puget Sound would increase significantly over baseline levels for Alki, even though the new flows receive secondary treatment, due to the increased volume of flows and industrial wastes from the Renton service area.

Biology

The eight alternatives at Alki were analyzed with respect to their impacts on biologic systems, including terrestrial habitats, the intertidal, Puget Sound, the Duwamish estuary, commercial and sport fisheries, and endangered species.

Terrestrial Habitats

At Alki and the Duwamish the proposed sites contain a negligible amount of terrestrial vegetation. The effects of construction would be negligible. Moderate positive effects could be achieved through landscaping, in which case Alternatives C and F, which allow for the greatest conversion to parkland, are most beneficial. The other alternatives allow for only minor-to-moderate landscaping. Landscaping is optional in all alternatives, however, and has not been included in facilities planning alternative costs.

The Intertidal

The service area intertidal is subject to sewer overflows primarily at Elliott Bay and at Alki/West Seattle. There is evidence of treatment plant effluent coming ashore at West Point, and current patterns suggest this phonomenon could occur adjacent to Alki. The frequency and distribution of the events are unknown. An apparent enrichment of algae at West Point and perhaps at Alki have been suggested as results of this. Also, fecal coliform bacterial levels exceed state shellfish water standards at all sites in the area. The source of bacteria has not been identified. No effects of effluent have been suggested for intertidal animals except grazers on algae which appear to show increased growth rates.

Overflows are small inputs relative to effluents; their frequency is fairly well known and quality poorly known. Effluent quality is known and frequency of impact on the intertidal unknown.

Overflows to the intertidal would be greatly reduced by Alternatives C and F, and slightly by Alternative D. CSO levels would be at baseline levels for Alternatives A, B, E, G and H.

Effects of solids and BOD and associated metals and toxicants in effluent would be reduced by 70 to 75 percent below baseline levels by secondary Alternatives E, G, and H. Solids and BOD loads to Alki from F would increase 4 and 3 times, respectively. Enhanced primary treatment, Alternative D, reduces these parameters by 28 and 24 percent below baseline B levels. Alternatives E, G and H actually improve effluent loads substantially. Alternative C eventually eliminates effluent effects altogether. Alternative F would greatly increase loads and flows with unknown effects on the intertidal.

Puget Sound

This category includes the biota of nearshore and offshore waters which are affected far less by sewer overflows than by effluents. Total nutrients loads to Puget Sound would be essentially unchanged in all Alternatives but F, which includes transferring Renton's flow into the Sound via a new Alki outfall. This would place a much larger nutrient source near one of the two places in the central Sound where major algal blooms develop.

Apparent changes in the diversity, abundance, and composition of bottom communities at West Point in the typical effluent plume position and along the depth contour at which effluent has neutral buoyancy are assumed to occur at Alki as well although this site was not sampled. The effects on animals are judged to be more related to solids and BOD loads than nutrients and so are more affected by effluent treatment levels. Thus secondary treatment Alternatives E,G and H would probably decrease the magnitude of the effect seen in time; Alternative D would maintain it at present (1975) or A levels but would be a decrease from baseline B levels. Alternative C in eliminating the plume, would probably allow for a decrease in the effects. Alternative F, in greatly increasing the plume, would probably increase them. Higher metals levels in Puget Sound biota near the outfall would be similarly reduced most by C, next by E, G and H as secondary treatment removes substantially more metals than enhanced primary treatment, and perhaps increased by F.

The cause(s) of the elevated incidence of tumorous flatfish at West Point has not been identified. The presence of the outfall pipe and/or its contents may be involved, but to an unknown extent; as a result, the effects of the various alternatives on disease incidence cannot be determined. Monitoring at Alki of disease incidence with Alternative F is recommended.

Under Alternatives A, B, C (until 1995) and D, the chlorine feed rate would be adjusted manually on a daily basis regardless of hourly fluctuations in effluent flow. This could result in overchlorination (toxic residuals in effluent) or underchlorination (insufficient bacterial removal). Average residuals have been calculated to occur to or above threshold levels for chronic effects, but no toxic effects have been observed in the field. Both improved chlorination and dechlorination facilities (chlorine contact tank and sulfonator, respectively) are included under Alternatives E, F, G and H. These would mitigate possible toxicity and underchlorination problems associated with the existing chlorination system.

Commercial and Sport Fisheries

Fish runs up the Duwamish through Elliott Bay would benefit by F, which transfers Renton flow from the Duwamish to Puget Sound and reduces Elliott Bay overflows by half. Under C, Renton flows to the Duwamish would be greatly increased and primary treated wet weather flows of up to 250 mgd would also go to the Duwamish --with undetermined effects. Alternatives D, E, G, and H would have the same effects as in Alternative B.

The Duwamish Estuary

The estuary would be benefited by F, which transfers Renton flows to Alki, and somewhat less by H, which has 16 percent lower flows to the Duwamish than baseline. An expanded Renton facility would have major effects on DO and nitrates in the estuary as the flows would almost equal the river's flow in summer. A large new discharge to the Duwamish in Alternative C could have adverse impacts, but of undetermined magnitude.

Rare and Endangered Species and Sensitive Habitats

No listed rare or endangered species are recorded from the study area. Critical or sensitive habitats, such as salmon rearing areas, fish migration routes, and waterfowl areas were discussed in other sections.

Natural Resources and Energy

Natural resources and energy impacts are not analyzed on a site-specific basis. Rather, these considerations are analyzed in the Regional Environmental Impact Statement on an interrelated basis between the five existing Metro plants and potential new sites.

The Human Environment

Many of the human environment facets pertinent to the Duwamish and Alki sites are discussed and evaluated only in the Regional EIS. This necessity to treat certain topics on a regional basis stems from the interrelatedness of the plants and the trade-offs between alternatives.

Land Use

Under Alternatives A and B there would be no expansion of the Alki site; under Alternatives C and D the expansion to enhanced primary would require no new land (under Alternative C, the Alki facility would eventually be phased out).

Under Alternatives E, G and H, expansion would use up one of the two baseball diamonds in Bar S Park. This park is currently operated by the Seattle Department of Parks and Recreation, but Metro has the right to develop it.

The Alki facility is on prime residential real estate; adjacent to a highly used beach. The impact of this land use is considered adverse, minor, long-term, irreversible, and definite under the alternative s which use this site. The expanded facility would use nearly twice as much land as the primary plant.

Under Alternatives C and F, the Duwamish sites of Diagonal Way and Harbor Avenue would be developed, respectively. Data is still being collected on the impact these Duwamish sites would have on land use.

Construction at any of these sites within 200 feet of the shoreline would require a permit from the Seattle Shorelines Master Plan.

Legal and Institutional

Legal issues are developed in the Regional EIS. Alternatives E, F, G and H comply with PL 92-500; Alternatives A, B, C and D do not. The NPDES permits also require compliance with a permitted time schedule, which is still being negotiated.

Agency and Neighborhood Goals

Many of the agency and neighborhood goals are developed in the Regional EIS. Those which can be most adequately developed in the Alki document are as follows: The goals of the Alki community council state that: "If it is economically and technically feasible, the unanimous vote of the committee is to close down the Alki plant. The property, including the Bar S playfields, should be reserved for use as park and recreation area for the neighborhood and for Seattle residents."

Alternatives A, B, D, E, G and H do not fulfill this desire of removing the facility; Alternatives E, G and H,in fact, implement expansion of the Alki facility. The Alki Plant is phased out only in Alternatives C and F. The impact on the Alki neighborhhod of phasing out the Alki facility would be favorable, major, long-term, irreversible, local and probable.

The impact on the Duwamish area of having a wastewater facility nearby, as would occur in Alternatives C and F, is still being determined.

Of 370 Alki residents interviewed, fifty-nine percent expressed a preference for upgrading sewage treatment facilities to secondary treatment, as required by law. Alternatives E, F, G and H would fulfill this objective; Alternatives A, B, C and D would not.

Alternatives C and F attempt to fulfill the priorities set by the PSCOG that "natural amenities identified as important to the region's character and beauty shall be preserved or sensitively developed as a second choice", by abandoning the Alki facility, which is on prime beach land; however, Alternatives C and F do not fulfill the same agency's goal that "existing public utilities, facilities, and services shall be used to their fullest prior to expansion," in light of the fact that the still-operable Alki facility would be abandoned.

Employment and Costs

Employment and cost considerations are developed in the Regional EIS.

Social, Recreational and Cultural

One of the two Bar S baseball diamonds would be condemned if secondarytreatment is installed at Alki, as is proposed under Alternatives E, G and H. This impact on recreation would be adverse, minor, long-term, reversible, local, and definite. Under Alternatives A, B and D, there would be no impacts on the Bar S playing field. Under Alternatives C and F, the Bar S fields would not be affected; further, with abandonment of the Alki wastewater plant, more recreational facilities could be installed.

Recreational usage of Alki beaches may be slightly affected by the presence of wastewater discharge and CSO outfalls; statistics on this are not available.

Currently, the water for the beaches at Alki do not exceed water quality parameters for bathing standards.

Archeological and Historical

No known archeological or registered historical sites would be affected by any of the alternatives at Alki.

An archeological site has recently been discovered across the Duwamish river from the Diagonal Way site. The Diagonal Way site should be investigated before this site is built upon, which would occur under Alternative C.

No data is available on the Harbor Avenue site, which would be developed under Alternative F.

Health and Safety

In Alternatives A, B, C and D, there may continue to be health risks associated with the consumption of shellfish due to the discharge of primary effluent, as discussed in the biological section of the EIS. Under secondary treatment, Alternatives E, F, G and H, this risk would probably decrease.

An unlikely safety hazard is accidental leakage of chemicals when they are in transport, or handled on site. Although nearly every U.S. water and wastewater treatment facility uses chemicals, there have been very few chemical-related accidents.

The health and safety problems related to sludge transport and disposal would be as probable as for any other trucks in transit.

Construction safety risk would be as for any other similar construction: with safety conscious procedures there should be a slim chance of accidents.

The safety risks related to chemicals, sludge transport, and construction would be minimal under all alternatives.

Aesthetics and Nuisance

The Alki wastewater treatment facility constitutes a major nuisance in its neighborhood: it emits odors, occupies valuable real estate, and discharges to Puget Sound. The Alki residents want to get rid of it. Under Alternatives C and F, the Alki facility would be phased out. But it would be replaced by a facility in the Duwamish; it is still being determined how much of a nuisance a facility in the Duwamish would be.

Under Alternatives A, B, D, E, G and H, the Alki facility would remain, a nuisance which is considered adverse, major, long-term, reversible, local and definite.

Under Alternative C, combined sewer overflows at Alki Point and to the Duwamish river would be 97 and 26 percent controlled; under Alternative D, they are to be controlled 18% at Alki, and not at all in the Duwamish. Alternative F would reduce CSO's to Alki Beach 97%, but not affect CSO's to the Duwamish. These are expected to make the water's visual appearance more appealing. At these locations, this is considered favorable, minor, long-term, irreversible and probable.

Sludge truck traffic is as indicated in Table 3-2. Although secondary treatment produces more sludge than primary treatment, the dewatering facilities provided in Alternatives D, E, F, G and H significantly reduce the volume and, hence, the number of truck trips required for ultimate disposal. Truck traffic would cause some nuisance on residential streets, and some congestion along an already crowded beach front, but the impact is considered minor; this topic was mentioned by few people in the HRPI and Gerhardt Research interviews at Alki.

There would be some nuisance during construction, especially at Alki under Alternatives E, G and H, and at Diagonal Way in Alternative C, and Harbor Avenue under Alternative F. These impacts would be adverse, minor, short-term, reversible, local and definite.

TABLE 3-2

Sludge Trucking Traffic (in trucks per day)

	A	B	C	D	E	F	G	H
Alki	1.7	1.7	0	0.6	0.5	0	0.5	0.5
Duwamish	-	-	0.3	-	-	4.8	-	-

CHAPTER IV

CITIZEN AND AGENCY INVOLVEMENT

The interaction between citizen and agency personnel (and their consultants) in the Alki area to date has included small group and information meetings, community meetings, contacts with civic leaders, and communication with neighborhood groups (particularly the Alki Community Council and its task force on sewage treatment plant expansion).

The first series of contacts of Metro's Clear Water Watch program in the Alki community were made in the spring of 1976 by the Human Resources Planning Institute (HRPI), Metro's social and economic consultant. A small group meeting was held with eleven people in attendance. Nine citizens attended a focus group meeting.

The first community meeting in the Alki area was held at the Alki Community Club on June 9, 1976. Attending were 34 area citizens, representatives of the Metro Council, Metro staff, Metropolitan Engineers (Metro's facilities planning consultant), and the Citizens' Water Quality Advisory Committee (CWQAC). Following a description of PL 92-500 and the facilities planning process, the panel presented the "merit" system-wide alternative as well as four alternatives for the Alki plant. Results of small group meetings and architectural site analysis were also presented and activities of the CWQAC were described.

The concerns and priorities expressed by the citizens in attendance included their desire for a voice in the design process, concern over plant odor, and a desire to see the plant moved, but not if such a move is much higher in cost than substantial plant improvements at Alki. Priorities for on-site improvements included odor control, avoiding removal of houses or the ballfield, construction additions over the road toward the shore or under the ballfield, or designing the plant site for multiple use (such as recreation). Other comments concerned ownership and options on the ballfield, federal funding limits, and effect of a plant expansion on property values. Because so many issues were raised, the meeting ended with formation of the Alki Treatment Plant Advisory Committee, to meet frequently to study plant alternatives and design criteria and to make recommendations. Metro staff prepared a summary of the meeting for those attending and maintains a copy on file in the Metro offices.

The second community meeting for Alki was held November 18, 1976 at the Alki Congregational Church. Attending were approximately 75 citizens plus representatives of Metro Council; various consultants involved in the study; and the CWQAC. The planning alternatives for Alki and the entire Metro system ("no action", "legal", and "goal") were presented along with discussion of architectural concepts and socioeconomic impacts.

The major issues raised by the citizens included odor (past, present, and future control), plant expansion (adjacent property, architectural treatment), system planning (local share of federal costs, inflation in possibly inevitable secondary treatment costs, compatibility of Duwamish plant with land uses there, accuracy of population projections, Interbay options, advisability of pursuing illegal options), combined sewer overflows and storm sewers (health hazard, location siting, incomplete problem solution by Forward Thrust program), water quality (effects of storm water runoff, flushing ability of Puget Sound, heavy metals control, relative position of Metro as a water quality leader), and rates (itemizing Metro rates separately, selection of inflation rate). A meeting summary was prepared by Metro staff, mailed to citizens attending, and maintained on file in the Metro office.

At the November meeting a representative of the Alki Task Force of the Alki Community Council presented the committee Report on Sewage Treatment Plant Expansion, dated November 11, 1976. The report unanimously recommended closing the present facility if it is technically and economically feasible. If that recommendation is not feasible, the committee recommended several criteria in conjunction with any future expansion: restrictions on facility height, size and function; minimum sludge truck traffic; odor control; architectural and landscaping features; elimination of further residential property condemnation; clear breakdowns of capital and operating costs; analysis of plant impact on beach or ballfield recreational areas; need for accurate estimate of federal, state and local financing; and evaluation of technological advances. The citizens in attendance unanimously approved the Task Force report.

Citizen and Agency Involvement

A third Clear Water Watch community workshop was held June 8, 1977 in the conference room of the Center House at Seattle Center. Among those attending were approximately 14 residents of the Alki area. The discussion centered on needed improvements at the Alki plant but included topics of regional concern.

Members of the Alki group feel strongly that the odor problem at Alki could be resolved at minimal expense, and that it is Metro's social responsibility to correct this situation. Participants noted that the Alki plant was poorly designed and felt that attention should be given to solving the present problem before addressing long-range alternatives. Even under Alternatives C and F, which solve the odor problem by abandoning the Alki plant, odors would continue through 1985. Residents requested that Metro consider an interim alternative to resolve the current odor problem. There was also concern over the need to preserve homes, property values and open land in the neighborhood. The possibility of improving the ballparks, rather than losing them to a larger treatment plant was mentioned. Citizens also expressed concern over the effects of primary effluent on Puget Sound. Citizens expressed skepticism toward Metro's attitude regarding secondary treatment and the ability of the Sound to safely assimilate primary effluent. The citizens also questioned the water quality improvements that would be gained merely by extending the Alki outfall. A recurring theme among participants was the need for more communication between citizens and Metro, and for Metro to trust the ability of the citizens to understand the situation -- when they are provided with all the facts. The public hearing on the Draft EIS for Alki is planned for October 27, 1977. A hearing on the Final EIS for system-wide alternative selection is scheduled for March 1978.

The site-specific comments to date from citizen and agency involvement in the Alki, Duwamish, and related alternative facilities locations have been considered in developing this Draft EIS (Volume II) for Alki. Future site-specific comments will be considered in the Final EIS (Volume II) for Alki. All regional or system-wide issues have been or will be handled similarly in the Regional EIS (Volume I of this series).

APPENDIX A

REFERENCES

See Regional Analysis EIS, Volume I, for references

APPENDIX B

ELEMENTS OF THE ENVIRONMENT

WAC 197-10-442 SPECIAL CONSIDERATIONS REGARDING CONTENTS OF AN EIS ON A NON-PROJECT ACTION. (1) The requirements of WAC 197-10-440 apply to the contents of a draft EIS on a proposal for a non-project action. Lead agencies, however, have greater flexibility in their approach to achieving compliance with the requirements of WAC 197-10-440 in writing an EIS for non-project actions, because normally less specific details are known about the proposal and any implementing projects, as well as the anticipated impacts on the environment.

(2) The lead agency should be alert to the fact that it is in the development and review of proposals for non-project actions where the range of alternatives is typically more broad than that of a proposal for a project action (which is often narrowed to a specific location and design). The proposal should be described in a manner which encourages consideration of a number of alternative methods of accomplishing its objective. For example, an objective of an agency's proposal should be stated as "the facilitation of the movement of people from point A to point B" rather than "the widening of an urban arterial in order to accommodate additional privately-owned passenger vehicles."

WAC 197-10-444 LIST OF ELEMENTS OF THE ENVIRONMENT. (1) Every EIS shall have appended to it a list of the elements of the environment in subsection (2), (3) and (4) of this section. The lead agency shall place "N/A" ("not applicable") next to an item when the proposal, including its indirect impacts, will not significantly affect the area (or subarea) of the environment in question. Items marked "N/A" need not be mentioned in the body of the EIS. Subsections (2) and (3) of this section correspond in subject matter to the questions contained in the environmental checklist used for threshold determination, and the questions in the checklist may be used to interpret this outline listing.

(2) ELEMENTS OF THE PHYSICAL ENVIRONMENT.

(a) Earth.
(i) Geology.
(ii) Soils.
(iii) Topography.
(iv) Unique physical features.
(v) Erosion.
N/A (vi) Accretion/avulsion.

(b) Air.
(i) Air quality.
(ii) Odor.
(iii) Climate.

(c) Water.
N/A (i) Surface water movement.
(ii) Runoff/absorption.

(iii) Floods.
(iv) Surface water quantity.
(v) Surface water quality.
N/A (vi) Ground water movement.
(vii) Ground water quantity.
N/A (viii) Ground water quality.
N/A (ix) Public water supplies.

(d) Flora.
(i) Numbers or diversity of species.
(ii) Unique species.
(iii) Barriers and/or corridors.
(iv) Agricultural crops.

(e) Fauna.
(i) Numbers or diversity of species.
(ii) Unique species.
(iii) Barriers and/or corridors.
(iv) Fish or wildlife habitat.

(f) Noise.

N/A (g) Light and glare.

(h) Land use.

(i) Natural resources.
(i) Rate of use.
(ii) Nonrenewable resources.

(j) Risk of explosion or hazardous emissions.

(3) ELEMENTS OF THE HUMAN ENVIRONMENT.

(a) Population.

N/A (b) Housing.

(c) Transportation/circulation.
(i) Vehicular transportation generated.
N/A (ii) Parking facilities.
N/A (iii) Transportation systems.
N/A (iv) Movement/circulation of people or goods.
N/A (v) Waterborne, rail and air traffic.
(vi) Traffic hazards.

(d) Public services.
N/A (i) Fire.
N/A (ii) Police.
N/A (iii) Schools.
(iv) Parks or other recreational facilities.
N/A (v) Maintenance.
N/A (vi) Other governmental services.

(e) Energy.
(i) Amount required.
(ii) Source/availability.

(f) Utilities.
(i) Energy.
N/A (ii) Communications.
N/A (iii) Water.
(iv) Sewer.
(v) Storm water.
(vi) Solid waste.

(g) Human health (Not including mental health)

(h) Aesthetics.

(i) Recreation.

(j) Archeological/historical.

(4) The following additional element shall be covered in all EISs, either by being discussed or marked "N/A," but shall not be considered part of the environment for other purposes:
(a) Additional population characteristics.
N/A (i) Distribution by age, sex and ethnic characteristics of the residents in the geographical area affected by the environmental impacts of the proposal.

WAC 197-10-446 DRAFT EIS--OPTIONAL ADDITIONAL ELEMENTS--LIMITATION. Agencies in their guidelines may add to the list in WAC 197-10-444 additional elements covering social, cultural and/or economic issues. Such additional elements shall become part of the environment for EIS purposes, and not otherwise. The guidelines of the lead agency shall control the content of the EIS, even though other agencies with jurisdiction are involved in the proposal. No agency shall prescribe additional material for an EIS beyond that which is required or optionally allowed by WAC 197-10-440 and -444, or which is added to the elements of the environment by the guidelines of the lead agency pursuant to the authority in this section [see WAC 197-10-440(14)].

PUBLIC AWARENESS, HEARINGS AND CIRCULATION OF DRAFT EIS

WAC 197-10-450 PUBLIC AWARENESS OF AVAILABILITY OF DRAFT EIS. (1) Upon publication of the draft EIS, the responsible official shall list the proposal in the lead agency's "EIS Available Register" maintained at the agency's SEPA public information center.

(2) The lead agency is encouraged, but not required, to use any reasonable method calculated to inform the public of the availability of the draft EIS and of the procedures for requesting a public hearing. Examples of such methods are publication of notice in a newspaper of general circulation in the county, city or general geographic area where the proposal is located; notifying private groups that are known to be interested in a certain proposal; contacting news media personnel and encouraging news coverage; and, placing notices in appropriate regional, neighborhood or ethnic periodicals.